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# USSR Report

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No. 24

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## USSR REPORT

## ENERGY

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## ELECTRIC POWER

### RAPID DEVELOPMENT OF ENERGY POTENTIAL OF SIBERIA URGED

Moscow NEDELYA in Russian No 26, 1980 pp 4-5

[Article by A. Illarionov, staff correspondent of "Izvestiya", Novosibirsk]

[Text] There is probably no scale with which one could measure the fortitude of people who are courageously building the Baikal-Amur Trunk Line, extracting Tyumen' oil and doing many other things which are combined in one idea: accelerated development of Siberia. It seems that one does not have to be an economist, or sociologist, or psychologist in order to estimate at its true worth such an important factor contributing to this acceleration as the way of thinking of the participants of the development of natural resources which formed during the years of socialist reforms on the land of Siberia. It is characterized by large scales and practicality. These qualities are evident most clearly when specialists gather to discuss the tendencies and prospects of further development. One of the representative meetings of this kind is the All-Union Conference on the Development of the Productive Forces of Siberia. The first such conference was held in 1926 and has been repeated periodically.

I attended two conferences: in 1969 and another one just a few days ago in Novosibirsk. At each of these conferences, the discussions were in the nature of broad collective studies and scientific and practical analysis. The last conference was attended by 1500 scientists, prominent party members, and executives. A wide range of problems were discussed at the plenary meeting and eighteen different sections. I shall dwell on one of them which, as it seems to me, is the most representative.

The following regular phenomenon shows itself more and more clearly in the approach to the use of natural resources: the higher the increment of the mining of minerals, the more we are concerned with the problems of their rational use. Scientists and economists are searching for the ways of using most advantageously each ton of oil, coal, each cubic meter of gas, and other types of natural raw materials.

It is known that experiments are now in progress for replacing oil as a motor fuel with more rational sources of energy. People call it justly "black gold" for its valuable qualities, but at the same time simply burn

this gold. Academician L. A. Melent'yev mentioned that it would be more effective to refine oil chemically in order to obtain many necessary products ranging from ordinary detergents to protein feed for cattle. It is more rational to use gas both as a chemical raw material and as fuel for large cities in order to keep the air clean. As for coal in Siberia, it should be used, together with its great rivers, for the production of electric energy.

Fifty years ago, when G. M. Krzhizhanovskiy, chairman of the union Gosplan, estimated the natural resources of Siberia explored by that time, he noted that, in spite of their remote location, they are not merely of local significance.

In 1930, a plan for a complex exploration of the Angara River was approved. Two years later, on the basis of the studies, the possibilities of the construction of powerful hydroelectric power stations on the Angara and Yenisey were discussed. The war interfered with the realization of the plans, but after the war, this problem was discussed again at a regular conference on the development of the productive forces of the region held in Irkutsk. At the same time the idea of uniting the power systems of Siberia was discussed...

Now, when I was listening to a short report of the head of the section of fuel and energy problems, corresponding member of the USSR Academy of Sciences Yu. N. Rudenko in the House of Scientists at Akademgorodok [Academic City], I remembered one of Siberia's largest power substations which bears the poetic name "Zarya" [Dawn]. An important event brought me there. But I shall not start with it, but with the first impression from that trip.

There was a forest of switches and circuit breakers on a 500,000 V distribution device installed in the open air. Sets of insulating ceramic rings shone impressively. Then I was led to gigantic automatic transformers weighing 250 tons each which were making so much noise that we had to shout to one another. Electric current from the Kuzbass [Kuznetsk Coal Fields] is transmitted to the Novosibirsk area through a 500 kilovolt electric power transmission line. The Kuzbass power system is reliably connected with the Krasnoyarsk system. And Novosibirsk receives the cheapest electric energy from the Krasnoyarsk Hydroelectric Power Station.

But the low cost of energy is not the only advantage. It is a great achievement to be able to maneuver the power resources of electric power stations. Today, the integrated power system covers a vast area of the southern part of the region stretching 4000 kilometers from Omsk to Chita. The fact that this length includes four time zones is, probably, one of the main reasons for this system. Let me explain this. When there is still night at its western end, a working day is in full swing at the eastern end. Instruments on the control desk of the joint dispatching control center indicate the increase of power consumption in the east at that time, and a stream of electric power from powerful stations is sent there. The picture changes sharply some ten hours later. Streams of power are sent to the west.

The effect of the maneuvering of electric energy within Siberia alone is equivalent to the operation of some additional station with the capacity of the Kuybyshevskaya GES.

Of course, to accomplish such maneuvering is not as simple as it may seem from a schematic description. "Zarya" workers showed me a room resembling the room of a large automatic telephone exchange where tens of thousands of conductors and a great number of relays were installed on vertical panels. When you look at this very complex equipment, you become convinced that not even a highly skilled operator can balance the production of energy and its consumption with the required speed. Only automatic logic circuits can analyze in the decimal fractions of a second the changes in the operation of the line, make a decision, and execute it. A high degree of sensitivity and high operation speed are, perhaps, the main qualities of the new domestically manufactured equipment.

Much was said at the present conference in Novosibirsk about scientific and technical programs and about planning the development of the unified power system of the country. Some of the speakers referred to these programs as long-term programs, not at all meaning that the unified power system is only a project of the future. It was pointed out in the Main Guidelines for the Development of the National Economy for the current five-year plan approved by the 25th Congress of the Communist Party that it is necessary to continue work on its formation by uniting the systems of Siberia and Central Asia with the system of the European part of the country. During my trip to "Zarya" I became convinced that this is real and is in progress today. One electric power transmission line (LEP-500) reached the substation from the east, another line extended from Kuzbass to the south, and another such line extended to the Altay. The latter was the last link in the chain of lines which connected, in the third year of the Tenth Five-Year Plan, Siberian power systems with the unified national system. Now, the difference in the time zones between its western and eastern wings is seven hours. This is only the beginning.

The formation of the unified power system of the country is continuing. Intensive work is in progress, and a number of scientific and practical problems have to be solved. For example, the growing power consumption on the country's scale cannot be satisfied by the power of LEP-500. In order to use more fully and rationally various energy resources of the Siberian region, it will be necessary to build new powerful electric power stations and transmission lines.

Power engineering is an integral part of the "Siberia" program, the goal of which is to determine all main aspects of the development of the region on the basis of thorough investigation. Several academic and industrial institutes are engaged in the development of power engineering problems. I shall give a few characteristic examples of their studies.

Specialists are often asked the following question: what should be built in the future -- GES or KES [condensation electric power stations]? Until quite recently, hydroelectric stations were considered almost ideal sources of electric energy: for example, they do not require any fuel and do not pollute the atmosphere. However, during dry years such stations failed the consumers. Moreover, sometimes the construction of dams necessitated the flooding of a certain part of valuable agricultural lands and forests.

However, power engineers did not give up the idea of building hydroelectric power stations, but at the same time they evaluated KES -- condensation (steam turbine) electric power stations -- at their true worth as a reliable and very stable source of energy. An important role in this evaluation was also played by the fact that Siberia has a uniquely inexpensive coal deposited almost on the surface. Therefore, further development of power engineering will progress here along two routes: creation of the Angara-Yenisey cascade of GES and construction of large thermal electric power stations using the coals of the Kansk-Achinsk basin and Kuzbass. It is the goal of further studies to determine their ratios.

To produce the necessary amount of power is only one half of the problem. It is also necessary to be able to transmit it at superlong distances to the European part of the country. However, the possibilities of ensuring its transmission through traditional lines are already exhausted for such distances and capacities.

In order to determine what electric power transmission lines should be in the future, numerous experiments and studies are conducted today. For example, a voltage approaching five million volts is being created in Novosibirsk in a building resembling a 40-meter reinforced-concrete cube. Man-made lightnings of unprecedented lengths are produced here. Because of its unusual nature, this is a somewhat frightening, yet attractive sight. Staring through the thick organic glass into the high-voltage room and trying to catch the infinitesimally short moments (1000ths of a second) of the life of the blue lines, you begin to understand the complexity and responsibility of the searching done by the scientists and engineers. Discharges of the man-made lightning fraught with a tremendous destructive force are roaring, but they look more like roots of a tree than a fiery dragon, because you realize that man controls it and makes it serve him.

E. Kaskevich, deputy director of the Siberian Scientific Research Institute of Power Engineering, said: "Everything is fine on the testing bench. But after such a discharge, an LEP can go out of commission. We must find a way to prevent it."

The pursuit of high and superhigh voltage is not an end in itself. By doubling the voltage, power engineers are increasing the carrying capacity of the line fourfold. However, there is a problem: when voltage increases, the electromagnetic field of the line also increases, and this means that there is some possibility of harm to life around it.

Scientists are now searching for ways of reducing the undesirable effect as much as possible. The following factor is not disregarded in their studies: assuming that the electromagnetic field becomes weaker having encountered a screen of green foliage, it is possible that a thought should be given to planting trees under the lines. If this measure is found to be practical, the wires will have to be suspended higher.

Such problems are combined into one of the independent directions of the institute's research. It has a special laboratory engaged in the problems of environmental protection. The importance of this laboratory can be seen from the fact that it is headed by the deputy director of the institute.

It should be mentioned that it is planned to make changes in the approach to the designing of electric power transmission lines and hydroelectric power stations. In any case, the problem of replacing technical and economic justification of construction with technical, economic and ecological justification is seriously discussed.

The first electric power transmission lines of over one million volts are already under construction. One of them is in Siberia.

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## ELECTRIC POWER

### IMPROVEMENTS IN MANAGEMENT OF POWER INDUSTRY DISCUSSED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 18 Jun 80 p 2

[Article by V. Verzhbitskiy, deputy chief of the Main Economic Planning Administration, USSR Ministry of Power and Electrification]

[Text] Our work is characterized by the fact that the production and consumption of electric energy practically coincide in time. This means that our industry has to produce at any moment of time exactly the same amount of electric and thermal energy as is consumed at that moment by the consumer. However, the demand for energy, unlike the demand for products of the majority of other industries, changes not once a year and not once a quarter, but every day and every hour.

Due to this and some other characteristics, the CPSU Central Committee and the USSR Council of Ministers, in their resolution on the improvement of the economic mechanism, classified the power industry among those sectors for which, due to their special characteristics, it is necessary to establish special planned indexes and economic norms.

This work is complicated and responsible. However, the changeover to the new system was not a surprise to us. We have been preparing for it for a long time. Since 1975, our industry has been conducting a large-scale economic experiment. We are perfecting such a combination of planned and accounting indexes which would stimulate reliable and effective operations to the highest degree.

A few years ago, each station was compelled to fulfill the plan for the production of electric power at any price. The personnel of the stations tried to put into operation every piece of equipment they had, including old and uneconomical using two or three times more fuel than the ministry's average. Such machines are needed not for constant work, but for covering peak-hour loads in power systems. However, they operated almost constantly, and fuel was wasted without any special need.

In the course of the experiment, it was decided to eliminate the production of power in physical terms from the group of basic indicators for each production association or electric power station. This indicator became merely

an accounting indicator. The result of this showed itself very soon. In the last five years, the consumption of fuel per kilowatt-hour of electric energy decreased by 13.8 grams. Of course, this showed the introduction of better power units. However, a substantial share of economy should be attributed to the experiments. During this period, thermal electric stations of the industry saved about 41 million tons of conventional fuel.

In other words, the experiment was successful. And now, for each enterprise, the "production of electric power in physical terms" will remain only as an accounting indicator. However, it is planned only for the entire industry as a whole in order to determine the needs in fuel resources and the necessity of putting into operation new production capacities.

Instead of the amount of electric energy, the first place is now occupied by such an important indicator as the specific consumption of fuel for the production of thermal and electric energy. Scientifically substantiated norms of specific consumption with consideration of the types of equipment and its parameters are being introduced.

We consider the development of such norms as a matter of priority. So far, we had many cases when the planning departments of production associations correct their technical and economic indices in order to match them with the achieved indicators. It is clear that they have no stimulus to improve them. Normative planning makes it possible to evaluate objectively the operation of each enterprise.

However, if the qualitative overfulfillment of a plan is not stimulated now, how is the state of affairs with the satisfaction of the needs of the national economy in the electric and thermal energy? What economic factor will ensure the necessary load schedule of an electric power station? Such a factor should serve as an indicator of the readiness of the equipment for carrying the load or, as it is called, the coefficient of readiness.

This coefficient is higher for the periods when equipment of the stations and networks works without any repairs. It depends on the operational quality of the machines, quality of repairs, and preventive measures, as well as on the technical improvement of the units. For example, during the first quarter of this year, the readiness factor of the power units of 800 megawatts was increased by 9.5%. This produced an additional 1.6 billion kilowatt-hours of electric power. This means both an increase in the reliability of power supply and the growth of the output-capital ratio of electric power stations.

On the whole, the industry's technical improvements and other measures implemented during the past year increased the capacities of the operating electric power stations by two billion kilowatts. Such an increase, undoubtedly, made it possible to react more flexibly to hourly changing needs of the national economy in electric power. This industry also has its special characteristics in the evaluation of labor productivity since the necessary volume of power production changes for reasons not depending on the personnel. Moreover, it is necessary to serve not only the operating equipment, but also the

standby equipment. Therefore, the ministry will be planning labor productivity and number of the personnel for its associations by the norms established on the basis of the amount and the complexity of the equipment being served. This indicator is not directly related to the amount of the power produced. However, it stimulates the personnel in using the labor resources more rationally.

However, the total amount of profit serves as a generalizing indicator which characterizes most fully the effectiveness of the use of labor, material and other resources.

It should also be mentioned that, by improving the economic mechanism, we also encounter some great difficulties. For example, the volume of power production does not always tie in with the limits of its consumption. So far, the ministry cannot balance the plans for electric power production with the plans for the fuel supply. Specifically, when determining the norms of coal consumption for the industry, the USSR Gosplan does not sufficiently consider the actually existing tendency toward deterioration of solid fuel. As a result of this, last year we were short of more than five million tons of reference fuel in terms of the caloric content, which is equivalent to a loss of 15 billion kilowatt-hours of electric power. Nevertheless, the Ministry of Power and Electrification is implementing measures which will make it possible to burn more low-grade types of fuel in the near future. For example, substantial reconstructions are being conducted at the Voroshilovgradskaya, Starobeshevskaya, Smiyevskaya, and other GRES.

It is not necessary to prove that under the new management conditions accurate balancing of the plans will have a decisive significance in successful operation of enterprises and industries. It is evident that the workers of the USSR Gosplan have to take effective measures in order to ensure this balance in practice.

At a recent conference in the CPSU Central Committee on the problems of development of the power industry we were posed with concrete problems for the acceleration of the development of the fuel and energy complex and increasing its effectiveness. An important role in this business has to be played by the improvement of the economic mechanism of the industry in which we see a promise of clear organization of work in all sectors of the power industry -- in its practice, in science, and in the construction of power facilities.

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## ELECTRIC POWER

### BALAKOVSKAYA NUCLEAR ELECTRIC POWER STATION UNDER CONSTRUCTION

Moscow GUDOK in Russian 3 Jun 80 p 4

[Article by I. Biryukov, head of Industrial Department of the newspaper KOMMUNIST, Balakovo]

[Text] Dmitriy Trofimovich Shutyuk, director of the Balakovskaya Nuclear Electric Power Station which is under construction said: "Here will be the AES power units which are being put into series production by 'Atomash' in accordance with the resolutions of the 25th CPSU Congress."

He showed me photographs of the models. They looked impressive even in the pictures. Huge buildings will soon rise on the left bank of the water reservoir of the Saratovskaya GES, on a huge vacant plot.

The production cost of one kilowatt-hour will be lower than at thermal electric power stations. Moreover, no railroad trains with coal or mazut which are required for a thermal power station will be coming here. A year's supply of nuclear fuel can be brought in containers on just a few trucks.

I asked him: "As a veteran of domestic atomic power engineering, what can you say about the safety of the station, a question of interest to many people?"

He answered: "I have been working at AES for 15 years. I compared notes with my colleagues from other stations many times. The designs of all nuclear reactors and units include multiple protection systems which prevent emergency situations. AES do not pollute the atmosphere with dust and gas. Therefore, the Balakovskaya station will be the cleanest station in the Saratov area."

I drove to the construction site of the Balakovskaya AES with the head of the administration of the Order of Lenin Saratovgesstroy A. Maksakov and party committee secretary Ye. Zaytsev.

A two-lane wide concrete highway led us southwest of Balakovo. There was a sign at a fork: "Balakovskaya AES. Young Komsomol construction site. Construction by personnel of the Order of Lenin Saratovgesstroy".

We drove on and saw a leveled area on the bank of the Saratov Sea, just as it was in the photographs. Here, foundation blocks are now being laid for the administration buildings and "Promstroy". Areas are marked with stakes for the bases of the construction organizations and subcontractors -- "Volgoenergomontazh", "Gidroelektromontazh".

Hydraulic engineers are working in the area of the water reservoir. Their task is to create a water reservoir which is to ensure continuous circulation of water for cooling nuclear reactors. Its area is 24 square kilometers. The first kilometers of the dam have already stretched into the sea. An electric power transmission line, LEP-110, and gas and water pipelines have already reached the AES construction site.

Balakovskaya AES is gaining momentum.

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## ELECTRIC POWER

### LAST POWER UNIT AT ZEYSKAYA GES COMPLETED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Jun 80 p 1

[Article by A. Shokhin, Director of Zeyskaya GES Construction Project, Amurskaya Oblast]

[Text] Yesterday, the sixth and last power unit at Zeyskaya GES was approved for industrial operation by the State Committee. The largest hydroelectric power facility of the Far East has been put into operation at its full capacity.

The Main Directions of the Development of the National Economy of the USSR for 1976-1980 approved by the 25th CPSU Congress contain a line which determined the goal and the high pace of the work of the builders of "Zeyagesstroy" during the Tenth Five-Year Plan: "To complete the construction of Zeyskaya GES..."

And now the Far Eastern river is turning all of the six rotors of this hydroelectric power station. The largest power facility in the eastern part of the country will ensure further development of the Far Eastern region. It has already been supplying power to the Central Section of BAM [Baikal-Amur Trunk Line] and the Southern Yakut TPK [territorial production complex].

"Sotsialisticheskaya Industriya" reported on the advanced engineering and technical solutions used on the Zeya River, on the solid buttressed dam which was constructed under such severe conditions for the first time, and on diagonal hydraulic turbines of a new type which makes it possible to operate the units at a lower head. Incidentally, the first units were started when the water head was only 45 meters instead of the usual 95. And the new units worked with a high efficiency factor.

Now, I would like to say a few words on such an important condition of success as the formation of the construction personnel and measures for preventing labor turnover. At the beginning of last year, we analyzed the progress of work thoroughly. The picture was revealing. The plan for the construction of production facilities was fulfilled at 94.6% from the beginning of construction, while the plan for the construction of nonproductive

facilities was fulfilled at 161%. For example, the plan for the completion of large-panel housing facilities was fulfilled at 130%, and the plan for educational, health, and public services facilities was completed at an even higher rate.

As a result of this, labor turnover at Zeyskaya GES was relatively low in comparison with other construction sites of power facilities in Siberia and the Far East even during the most unfavorable years. And when the main construction jobs were in progress, during the period of maximum stress, almost no one left the construction site.

The backbone of the "Zeyagesstroy" personnel consists of skilled workers who are experts in their fields. I. Yevseyev, leader of an outstanding complex brigade, who worked previously in the construction of Bratskaya GES, was awarded the title of Hero of Socialist Labor at Zeyskaya GES. Petr Shuy-skiy, an old local resident, carpenter and concrete worker, whose family was known on the Zeya since the last century, was awarded the orders of Lenin and October Revolution for his participation in construction. The construction personnel consisted chiefly of young people. They had every opportunity to express and assert themselves. For example, Viktor Chepurnoy, who came from Moldavia, became a recipient of the Lenin Komsomol Prize. Now he is going to build the Bureyskaya GES. Viktor Vitnikov, who was a young specialist quite recently, is now in charge of the administration of mechanized jobs. And V. Shchuplyakov, who came to the Zeya from the army and was a foreman recently, is now deputy head of "Zeyagesstroy" at Bureyskaya GES.

This construction site truly became a training ground for the personnel. And even those who left us at one time often returned, which confirms the correctness of our policy. We are continuing it, being guided by the directives of Leonid Il'ich Brezhnev given by him during his trip to Siberia and the Far East.

Today, our guests who came to share our great celebration are admiring not only the impressive panoramic view of the GES, but also the well-organized microrayon of the city. It has all the necessary facilities: schools, children's institutions, hospitals, shops, and clubs. The Palace of Sports has a swimming pool.

The experience of the construction of Zeyskaya and Bureyskaya GES makes it possible to make certain conclusions about the development of infrastructure in remote construction areas. Experience shows that the efforts spent on the creation of good living, working, and relaxation conditions are not wasted.

The construction personnel of the two Far Eastern hydroelectric power stations is proud of the fact that they are creating a power base for developing the rich resources of this territory. According to preliminary calculations, all expenditures for the construction of the Zeya hydropower complex will be returned to the government by the time of its completion. Inspired by the speech of Comrade L. I. Brezhnev at the June Plenum of the CPSU Central Committee, the builders are determined to bring this moment closer and to mark the 26th CPSU Congress by their new labor achievements.

## ELECTRIC POWER

### CAPACITIES OF EKIBASTUZSKAYA GRES DESCRIBED

Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 11 Apr 80 p 2

[Article by V. Stupak (Ekibastuz): "Energy Giant"]

[Text] The 300-meter high pipe of the Ekibastuzskaya GRES, like a beacon in the sea, can be seen from more than 20 miles away. The energy which originates in the hot furnaces of the electric power station, in the mighty vortex of the turbine, carries light and power to motors that are even farther away--thousands of kilometers.

One does not immediately notice Nikolay Bugrimov's fitters at the foot of the giant pipe. The figures of people in canvas ponchos on the layered steel grating remind one of tireless little spiders: some of are weaving flexible bars into honeycombs, others are practicing witchcraft with electric welding, and still others are sorting and juggling bunches of steel. The fitters are in a hurry: after them come the carpenter-cement workers of Flyun Fattakhov's brigade who pour a heavy gravel-cement mixture from a tub into the bottomless interwoven network of the structure's carcass. A week of continuous work and 350 tons of burnished metal and 1,500 cubic meters of concrete will lie for centuries here in order to reliably carry on their shoulders the many tons of draft machinery. Behind the backs of Bugrimov and Fattakhov hangs the bulk of the main skeleton which already contains more than 10 of these monoliths which have been created by the hands of their brigade in less than 3 years. They support the bodies of the turbo-generator, boiler and mills, trembling with strain, which are already operating for the good of the people. And in front of the brigades are only reddish-brown clumps of earth and the still untouched steppe. It must be ripped open by the blade of a bulldozer in order to lay new, indestructible foundations for mighty machines which generate electricity. Four million kilowatts--such is the capacity of the first of the four Ekibastuz giants of electricity.

If one glances towards the city from here, one's gaze first fixes on a flat, circular "loaf" which takes up half of the horizon. This is the blanket of earth taken from the underground Ekibastuz treasure house. The solid layer of coal which is 100-180 meters thick contains more than 7 billion tons of

energy fuel. And even though at the beginning of the century these supplies were valued considerably more modestly, and about a thousand versts away there were not even outposts of developed industry, Vladimir Il'ich Lenin, with foresight and absolute precision which are impressive today, determined the position and significance of the deposits. "The most important of all the issues is Ekibastuz and its significance for the Urals" and, it is predicted, it is precisely at this point on the globe, which was previously remarkable in no way, that there is an energy complex which so far knows no equal on the planet. Russia, torn by intervention and civil war, experienced collapse, famine and counterrevolutionary attacks, but Lenin found time and energy to return again and again to Ekibastuz in order to assign specialists and party workers to study more deeply the problems of the development of Ekibastuz and finally to change their mind about their prejudiced, negative attitude toward Irtysh coal.

The idea of mastering the Ekibastuz deposits was never removed from the agenda. Its implementation was made more difficult initially by the lack of a railroad (the Voskresenskaya branch was built for the salt industry in the 1920's) and then by the Great Patriotic War. The assimilation of Ekibastuz began during the first years of peace, when the Yuzshiba steel main line came here. But it turns out that Il'ich also managed to have a hand in this matter. On 13 May 1921, as chairman of the Council of Labor and Defense, V. I. Lenin signed a decree concerning the construction of the Ekibastuz-Pavlodar railroad and a railroad bridge across the Irtysh. According to Il'ich's profound design, as early as that time Ekibastuz was to be joined by a steel track with the Urals and Siberia so that the shortest route would be opened up to it. Without this support, the miners of the Irtysh area would hardly have been able in 1954 to send the first batches of the fuel that was most accessible and advantageous to the Ural electric power stations.

Now each day from 40 to 50 heavy loads of coal--4,000 and more tons each--are sent to various corners of the country, right up to the Moscow area. There are 20 electric power stations in the Urals, Siberia and Kazakhstan with a total capacity of 15 million kilowatts that are operating on Ekibastuz fuel. They produce more electric power than the entire country produced in pre-war years! This is what Ekibastuz is today.

The tomorrow of Ekibastuz was clearly determined by a decree of the CPSU Central Committee and the USSR Council of Ministers, "On the Creation of the Ekibastuz Fuel and Energy Complex and the Construction of Ekibastuz-Tsentr Direct Current Electric Power Transmission Lines with Capacities of 1,500 kilovolts." The country is investing 7.6 billion rubles in this project. This is more than the KamAZ required.

The largest investment of public funds in one complex in the entire history of Kazakhstan will become new coal mines and five large electric power stations, a new city with a population of 200,000, a main railroad line to Karaganda, a unique power bridge 2,400 kilometers long and the establishment

of dozens of scientific laboratories and institutes. An energy tekhnikum and an evening school of the industrial institute have already been opened, and a branch of the Ukrainian Scientific Research Institute of Coal has begun to operate. The creation of a direct current electric power transmission line and its transformer substations which have no analogues on the planet are a unique scientific experiment of unprecedented industrial scope.

But the main thing is the birth of the ETEK [Ekibastuz Thermal Electric Power Complex]. This is an army of 25,000 miners and energy construction workers who are inspired by a wish to embody Lenin's idea about Ekibastuz in a complex of a worthy scale. The mining brigade of Barri Mozer from the Tsentral'nyy section made their city famous because they broke all productivity records with their rotary equipment which produces "thousands." The machine builders of the Lauhammerwerk (GDR) who manufactured this rotary innovation ten years ago, when they came last autumn to Ekibastuz, were quite surprised by its excellent condition after such a long period of operation at heavy coal mining areas, for which the German machine was poorly adapted.

The manager of the first domestic mining complex with a capacity of 5,000 tons of coal an hour, Anaoliy Shishlov, and his crew, by adjusting and assimilating the gigantic new coal scoop, last year managed to bring 7.3 million tons of fuel to the surface, which was a half million tons more than was assigned. This year the advanced crew from the Bogatyr section has earmarked higher goals for extraction--7.5 billion tons.

Through the efforts of such brigades, and there are no less than 15 of them at the sections of Ekibastuz, labor productivity per worker per month increased to 940 tons. This is 12 times as great as the level for the branch as a whole and almost twice as much as the average for open mining in the country. In terms of labor productivity the Ekibastuzugol' association has outstripped such countries with highly developed open coal mining as the United States, the GDR, Czechoslovakia and Poland.

This year the famous collective plans to extract 70 million tons of energy fuel. This is 10 million tons more than last year. Such rapid growth destroys all customary ideas of the rates of increase in extraction in mining branches. But the party has set the task of putting four power blocks with an overall capacity of 2 million kilowatts into operation by the end of 1980. Machine tools and electric furnaces throughout the immense expanse from the Urals to Rudnyy Altay are already awaiting current from them.

Since the beginning of the five-year plan 385 million rubles' worth of capital investments have been assimilated in Ekibastuz and 210 rubles' worth of work has been performed. Last year 5 times as much work was done as in the first year of the five-year plan. Capacities were put into operation for mining 20 million tons of coal. The largest coal mine in the world, the

the Bogatyr, has reached the completion of its construction and its planned capacity--50 million tons of coal a year.

But still, despite the high rates, today's results can not be fully satisfactory. Speaking at the November (1979) Plenum of the CPSU Central Committee, Comrade L. I. Brezhnev listed fuel and energy among the most important problems facing the country. In order to improve the country's fuel and energy balance, he said, in particular: ". . . we must accelerate the assimilation of the Ekibastuz, Kansk-Achinsk and Kuznets fuel and energy complexes and, of course, the construction of the corresponding electric power transmission lines, above all, the Ekibastuz-Tsentr line with a direct current capacity of 1,500 kilovolts. I note, incidentally, that the construction of the unique thermal electric power stations in the east of Kazakhstan is getting off to a poor start. I would recommend that comrade P. S. Neporozhniy immediately take charge of things, energetically intervene in the matter of Ekibastuz, and take the necessary measures."

Measures are now being undertaken. The plants have received instructions to deliver equipment to the GRES ahead of schedule and specialists are going on temporary duty from the Urals, Siberia and the Ukraine in order to help accomplish something that nobody in power engineering has managed to do yet--to assemble four "500's" and put them into operation in a year. This can only be done by relying on the entire country's help.

Various people are working on the ETEK. They have come here in response to their own hearts. They are not afraid of the strong steppe winds, nor the frosts, nor the temporary inconveniences. "The eyes are afraid, but the hands work,"--so say those who from day to day, rock after rock, slab after slab, are constructing the walls of the ETEK. And new blocks of buildings are going up, the body of the GRES is being constructed and supports for the electric power transmission line are marching over the horizon. Time will pass and much will be forgotten, but can one really forget the name of Petr Zaytsev, whose brigade laid the foundation for the first boiler? Or the name of Bektimur Aralbayev whose team placed on the concrete pedestal the bulky steel boiler aggregate which was 60 meters high. To this day they remember here how all the construction workers were so worried in the autumn when the cold weather came and it was necessary to fill the water reservoir in a hurry when the deep water intake was not ready. Everyone looked hopefully at Dem'yan Nikiferovich Koloshin, the manager of SU-TETs-3. His collective had to manage to do everything and not forget anything, right down to the insignificant trivia. And he succeeded!

Now waves from the water reservoir splash against the concrete walls of the electric power station. Under the arches are the hum of steel cores and the roar of the flame caused by Ekibastuz blazing in the sun. And is it not remarkable that at this point on the planet which at one time was not noticeable, now on the anniversary of the birth of leader, a new electric sun is to be born, one that is twice as powerful as that of all of Russia when V. I. Lenin, drawing the famous plan of the State Commission for the Electrification of Russia, in the section entitled "Electrification of Western Siberia" wrote, "Of the other deposits, the most important are the Ekibastuz mines near Pavlodar."

## ELECTRIC POWER

### KOL'SKAYA AES DESCRIBED, DEVELOPMENT PROGRESS REPORTED

Moscow ELEKTRICHESKIYE STANTSII in Russian No 6, Jun 80 pp 2-8

[Article by A.P. Volkov, director, Kol'skaya [Kola] AES: "The Kol'skaya AES--the Firstling of Nuclear Power for the Polar Regions"]

[Excerpts] The Kol'skaya Nuclear Power Plant, erected on the picturesque shore of Imandra--the largest lake of the Kola Peninsula--was planned in two phases. Included in the first phase, which went into service in June 1973 (unit I; unit II in December 1974), are two power units with a total installed power of 880 MW. The second phase will also consist of two power units (similar to the existing), after whose entry into service the installed power of the Kol'skaya AES will equal 1760 MW.

In 6.5 years of operation (from June 1973 to January 1980) the Kol'skaya AES has generated more than 28 billion kWh of electric power. For the results of its work in 1978, the power plant's team was awarded the challenge red banner of the CPSU Central Committee, the USSR Council of Ministers, VTsSPS [All-Union Central Trade Union Council] and the VLKSM [All-Union Leninist Communist Youth League] Central Committee with entry onto the All-Union Honor Roll of the USSR VDNKh [Exhibition of Economic Achievements].

#### Description of the AES

In the Kol'skaya AES's units are installed pressurized water-cooled power reactors (VVER's) with an electric power capacity of 440 MW. The heat transfer agent and neutron moderator is water with a boric acid solution.

The AES's technological layout provides for two heat removal circuits. The primary (radioactive) circuit includes the reactor, six circulation loops with six main circulating pumps (GTsN's) and six steam generators. The pipelines of the circulation loops are connected to the inlet and outlet connecting pipes of the reactor vessel.

Through the inlet pipe connections the water enters between the well and vessel down the reactor and then from the bottom to the top through the

core, removing heat from the fuel elements, and through the outlet pipe connections is fed to the steam generators. The temperature of the water at the reactor's inlet is 265 to 270°C and at its outlet 295 to 300°C and the pressure of the water in the primary circuit is 125 kg/cm<sup>2</sup>.

The flow of water through the core is created by circulating pumps and the flowrate equals 43,000 m<sup>3</sup>/h; the volume of water in the primary circuit is 230 m<sup>3</sup>. The main construction material for the equipment of the primary circuit is stainless steel. The reactor vessel is made of heat resistant chrome-molybdenum-vanadium steel.

The secondary (nonradioactive) circuit includes six steam generators and two turbine units whose technological layout is similar to that of thermal power plants.

The heat transfer agent of the primary circuit, passing through the steam generators, surrenders its heat to the water of the secondary circuit, converting it into steam. Serving as the heat exchange surface in each steam generator are 5536 U-shaped stainless steel tubes. The dry saturated steam produced by the steam generators is fed to the turbines. The steam capacity of a single steam generator in the nominal operating mode is 452 t/h.

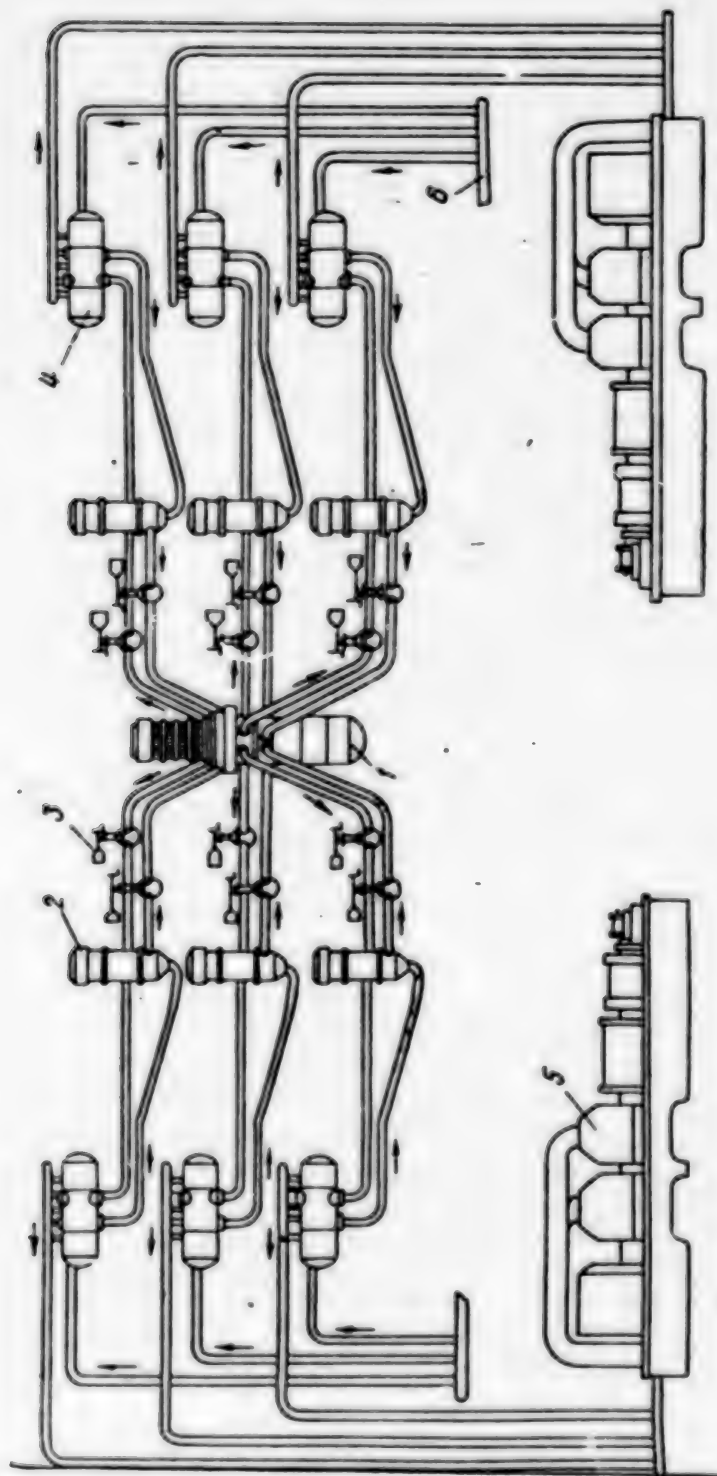
The core, 3 m in diameter and 2.5 m high, is placed in a hollow cylindrical cage installed in the reactor vessel, which is 11.8 m high with a diameter of 4.3 m; the weight of the reactor vessel is 200 t. The core is assembled from 349 hexagonal assemblies with fuel elements. The walls of the assemblies are made of a zirconium alloy.

In working assemblies there are 126 fuel elements of the rod type with a core consisting of sintered uranium dioxide in pellet form and a jacket made of a zirconium alloy; the diameter of the fuel elements is 9.1 mm and the lattice spacing is 12.2 mm.

The fixed enrichment of uranium dioxide with isotope U<sup>235</sup> is 3.6 percent.

Reloading of the core is carried out with the reactor shut off, by remote control, under a bed of water, by a special reloading machine.

The removed spent assemblies are placed in a holding basin for the purpose of removal of the residual heat release of the fuel elements and for storage. Every year one third of the working assemblies is unloaded from the reactor and the same number of assemblies with 3.6 enrichment is added. The reloading schedule provides for the alternate shutdown of reactors, as a rule, in the spring-summer period.



[Caption and key on following page]

Figure 1. Schematic Diagram of Power Unit with VVER-440 Reactor:  
1—reactor; 2—main circulating pump; 3—main gate valve;  
4—steam generator; 5—turbine; 6—feedwater collector

### System for Controlling and Protecting Reactors

Control and rapid stopping of the chain reaction, as well as maintenance of the reactor in the subcritical state, are accomplished by the controls of the control and protection system (SUZ)—by automatic control and compensation assemblies (ARK's). Thirty-seven ARK assemblies are installed in the core.

An ARK assembly consists of two halves—a fuel and absorbing. The fuel half of the assembly is similar in construction to a working assembly. The absorbing half of an assembly is in the form of a hexagonal tube made of boron-containing stainless steel and designed for absorbing thermal neutrons participating in the uranium fission reaction.

The process of regulating the reactor's output or of stopping the chain reaction is carried out by withdrawing from or inserting into the core the absorbing halves of the ARK assemblies while simultaneously inserting or withdrawing the fuel halves.

The reactivity excess for burnup of the fuel (providing a reserve of fuel for the period of the reactor's operation prior to reloading) is compensated by boric acid dissolved in the heat transfer agent of the primary circuit.

### Monitoring System

The parameters of the nuclear steam producing unit (YaPPU) are monitored from unit control boards (BShchU's).

On a BShchU are concentrated indicating and recording instruments which measure the neutron flux in all operating modes of the reactor, the temperature of the water in the primary circuit, the temperature of the feed water of the secondary circuit, the pressure of the water of the primary circuit and of the saturated steam at the outlet of the steam generators, the flowrate of water and steam in the secondary circuit, the temperature of the water at the inlet and outlet of working assemblies, the electrical parameters of generators and consumers of internal needs, as well as the key parameters of the auxiliary technological systems of the primary and secondary circuits.

A computer is employed for the purpose of issuing rapid information on the operation of the AES's technological equipment and technical and economic indicators of power units. A control computer system will be installed in units III and IV.

## Radiation Safety

The work safety of operating personnel and prevention of the harmful effect of the AES on the environment are made possible by a combination of apparatus and by a radiation protection system.

All YaPPU equipment which is a source of radiation is enclosed in airtight ferroconcrete boxes making it possible to lower the intensity of radiation to permissible limits. All production areas associated with operation of the YaPPU are constantly monitored for radiation with the automatic issuance of warning signals.

Information on the radiation level of areas and systems is displayed on a radiation monitoring board. Work relating to the servicing and repair of AES equipment is done under the supervision of the radiation monitoring service, which does its job in keeping with the recommendations of the International Commission on Protection from Radioactive Emission.

All radioactive water at the AES is treated in special water decontamination plants (SVO's). Radioactive waste (distillation waste, ion exchange resins) is discharged into ferroconcrete containers clad with stainless steel.

The ventilation air from all areas is decontaminated with special units. Air purified of radioactive impurities is exhausted through a stack 120 m high.

Constant radiation monitoring of the environment in the area of operation of the Kol'skaya AES has confirmed the absence of a harmful effect on the environment.

## Production Operations

The Kol'skaya AES since the start of its operation has generated more than 28 billion kWh of electric power, 22 billion kWh of which in the 10th Five-Year Plan period; the specific consumption of conventional fuel for the production of electric power has been reduced by 72.9 g/kWh, on account of which 87,600 t of conventional fuel have been saved; labor productivity has been increased 127.4 percent.

During the entire period of operation at the Kol'skaya AES have been performed more than 1000 measures relating to the construction and modernization of equipment, aimed at improving the reliability, safety and economic efficiency of the AES's operation, with a savings of more than 10 million rubles.

The most important of these are the following: the operation of Kol'skaya AES units at an output higher than the nominal; the organization and introduction of modern methods of managing the water and chemical system of

the electric power plant; the introduction of a self-contained unit for the decontamination of steam generators; the development and introduction of equipment for inspecting the VVER-440 reactor vessel (URK-1); the introduction of a mechanical bolt cover for the M 140 bolts of the main joint of the VVER-440 reactor vessel; the reconstruction of steam generator collectors; the introduction of automatic equipment for starting the turbines of unit II; and the reconstruction of the steam distribution system from a nozzle type to a throttle type.

The operation of the Kol'skaya AES has made possible the annual freeing of more than four million tons of coal. A thermal electric power plant with an electrical output equivalent to the output of the Kol'skaya AES would have exhausted annually into the atmosphere 23,000 t of oxides of nitrogen and sulfur dioxide and 370,000 t of ash. Nine hundred and fifty thousand tons of slag would have been dumped into the cinder heap.

Thus, the effect of the Kol'skaya AES on the environment is minimal. Able to serve as an example of this is the trout fishing industry which has been in operation successfully for six years already in the mouth of the AES's discharge canal.

#### Operation of Units at Increased Output

Able to be placed under the heading of important measures for improving the economic efficiency of power units and the AES as a whole are the substantiation and practical operation of Kol'skaya AES units at increased output levels.

During the period 1973-1978, based on an analysis of experience gained in operation of the AES, it was established that the key equipment, cores and auxiliary systems of units possessed a definite potential. This made it possible to proceed to the development and performance of a number of technical and organizational measures making it possible to operate the equipment at increased loads.

The most important of these are the following: the installation of additional safety valves in the primary circuit; separation tests of the steam generators of unit II, which showed that the moisture content of the steam produced was below the permissible values; the performance of a great amount of work relating to monitoring the state of the metal of equipment in the primary circuit; thermal tests of all phase-one turbogenerators; the development and introduction of a method for continuous monitoring of the activity of the heat transfer agent of the primary circuit; and the introduction of continuous intrareactor monitoring of the neutron flux in the reactor's core.

The measures carried out were aimed at improving the reliability of the operation of the Kol'skaya AES's equipment.

Since December 1978 the first phase of the Kol'skaya AES has been operating at an output of 940 MW maximum (100 to 107 percent of the nominal), which has amounted to a savings of 14 million rubles of capital investment and has produced an annual additional output of electric power to the tune of four million rubles.

The technical and economic indicators of phase one of the Kol'skaya AES are given in the table.

Indicator	Planned values	Values achieved
Electric output of a unit, MW	440	470
Consumption of electric power for internal needs, %	6.6	5.5
Efficiency (gross/net), %	31.48/29.41	33.2/30.1

#### Chemical and Water Conditions in Main Circuits

The personnel of the Kol'skaya AES has done a great deal of work on improving the chemical and water conditions of the primary and secondary circuits. Much attention has been paid to questions relating to the automation of chemical monitoring.

For example, a chemical and water system has been tested and introduced for the primary circuit of unit II, utilizing hydrazine hydrate. The introduction of this system has created the technical prerequisites for reducing the radioactive contamination of equipment of the primary circuit.

The Kol'skaya AES together with the "Energiya" NPO [Scientific Production Association] and the Soyuzenergoavtomatika TsPKB [Central Planning and Design Bureau] has developed a project for automating chemical monitoring of the secondary circuit and SVO-3,5 units. The project was executed on the basis of domestic instruments.

This system for automatic chemical monitoring of the water system is designed for on-line monitoring of the water of the condensate and delivery system and drainage tanks with the output of data to a computer. The anticipated savings equals 130,000 rubles on account of the freeing of six laboratory technicians and of reducing radioactive waste from the SVO-3,5.

A system for automatic chemical monitoring of the heat transfer agent of the primary circuit for reactors of the VVER type was developed by the Kol'skaya AES together with the VTI [All-Union Institute of Heat Engineering] imeni P.E. Dzerzhinskiy. Included in automatic chemical monitoring is continuous monitoring of parameters, making it possible to obtain information on processes taking place in the primary circuit. The savings from the introduction of a system for automatic chemical monitoring of the primary circuit has equaled 200,000 rubles on account of the freeing

of 10 laboratory technicians and of improving the reliability of the AES's operation.

#### Improving Reliability of the Operation of Turbines and Auxiliary Equipment

At the Kol'skaya AES a great amount of work has been done, aimed at improving the reliability of the main and auxiliary equipment of the secondary circuit.

In the operation of a turbine with saturated steam characteristic erosion damage is evidenced in individual elements of the circulating section; for example, the wear of high-pressure cylinder joints at points of fitting of end seals and rings and wear of the joints of high-pressure cylinder diaphragm rings.

Improvement of the design of the packing of the high-pressure cylinder horizontal joint has made it possible to extend the operating period of a turbine between repairs to three years and more.

For the purpose of automating processes of starting up turbine units (plants No 3 and 4), at the Kol'skaya AES has been installed automatic equipment for starting turbines, which was developed by the VTI. Its use has improved the reliability and maneuverability of turbine units.

#### Decontamination of Equipment

The main share of radiation monitoring costs in carrying out preventive maintenance work is for work relating to testing and inspecting steam generators, the main circulating pump and ARK [automatic regulation and compensation] drives.

At the Kol'skaya AES has been installed a special decontamination unit for decontaminating SUZ [control and safety rod] drives, the hollow section of the main circulating pump and other equipment.

The electric power plant together with the VTI has developed and introduced a unit for the independent decontamination of steam generators. This unit makes it possible to carry out chemical decontamination by successive flushing of the steam generator tube with alkaline and acidic solutions. The savings from using this unit has been 600,000 rubles per year for two units with a VVER-440.

#### Further Expansion of the Kol'skaya AES

In the next few years the output of the electric power plant will be doubled.

The construction of power unit III has entered the decisive stage; the main vessel is being closed and the reactor's well is being prepared for

installation of the vessel. The entry into service of this unit is planned for 1980, and of the next--power unit IV--for 1982.

#### Socialist Competition at the Power Plant

The team at the Kol'skaya AES responded fervently to the decree of the CPSU Central Committee, USSR Council of Ministers, the VTsSPS and VLKSM Central Committee "Regarding the All-Union Socialist Competition for Increasing Production Efficiency and Work Quality and for Successful Fulfillment of the Quotas of the 10th Five-Year Plan."

Every year the team at the Kol'skaya AES has taken on socialist obligations which have made it possible to do the following: on account of the better utilization of power capacities and reduction of the idle time of equipment in repairs, to generate above the plan more than 232 million kWh of electric power; on account of the accomplishment of optimal conditions for the operation of equipment and of the improvement of technological processes, to reduce the consumption of electric power for internal needs and to produce for consumers an additional 32 million kWh; on account of the introduction of organizational and technical measures, to gain a theoretical savings of more than 10 million rubles.

At the electric power plant have been developed the conditions for socialist competition between shops, departments and AES continuous shifts. "Maximum Labor Productivity for the Five-Year Plan Period of Efficiency and Quality" is the motto under which section teams have competed.

Turbine operators M.I. Yepifanovskiy, M.S. Gorshkova and M.I. Korchinskaya came up with the initiative of running four turbogenerator sets instead of two. Having introduced a number of organizational and technical measures, they fulfilled the obligations assumed and since 1978 have been operating four turbine units each.

Other sections have supported the initiative of the turbine operators. On account of expansion of the area serviced and of the mechanization and automation of production, the number of operating personnel at existing units has been reduced by the reactor section, the thermal automatic equipment and measuring section, the electrical section and the chemical section. A total of 37 people have been freed, which at the present are working actively on construction of unit III.

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## ELECTRIC POWER

### NOVOVORONEZHSKAYA AES FIFTH POWER UNIT DESCRIBED

Moscow SOVETSKAYA ROSSIYA in Russian 20 May 80 p 1

[Article by SOVETSKAYA ROSSIYA Correspondent A. Pyatunin: "Head Reactor of the Nuclear Hercules"]

[Text] The fifth power unit, the head unit, is coming into play at the Novovoronezhskaya AES. Soon the first few thousand kilowatt-hours of electric power from it will enter the country's United European Power System.

It is not a copy of its predecessors, although it also has a vessel reactor of the water-cooled type differing in dimensions slightly from that installed in the fourth unit. But in terms of its power—one million kilowatts--the fifth power unit surpasses the fourth more than twofold!

But it is not only a question of power. The fifth is distinguished by a number of fundamentally new design decisions. For the first time in the practice of the construction of nuclear power plants in our country the reactor and all the basic equipment of the first radiation circuit are jacketed in a protective shell. This is an enormous ferroconcrete cylinder with a dome, inside of which have been installed 150-mm cables made of high-strength steel wire. Below and on top the ends of these twisted cables are fastened by anchoring devices and are tightened by powerful hydraulic jacks. In addition, the entire inside surface of the shell is lined with metal. This "straitjacket" has been called upon to guarantee safety of the environment in any emergency situations.

The water supply system has also been reorganized in the fifth unit. Every day hundreds of thousands of cubic meters of water are required to cool the spent steam in the condensers of the plant's turbines. In the first and second units for this purpose is used the river bed of the Don River and in the third and fourth water-cooling towers, but for the fifth a large manmade reservoir has been constructed. The area of this water table is 600 hectares. In the future the storage dam will become a fishing pond.

Not one of the four existing units of the plant can be compared with the fifth also in terms of the level of automation of the system for controlling technological processes and for monitoring the operation of the highly complex equipment and measuring instruments. Attendant engineer-operators of this unit's control board constantly monitor the state of all systems: They are assisted by computers and television sets hooked up to the control system.

There are many innovations also in the layout of the equipment and in the position of certain work areas.

For example, the protective shell enclosing the nuclear "heart" of the plant and the key equipment of the reactor section made it possible to pressurize the common space of the structure instead of numerous sections.

All the technical innovations in the end result yielded a number of important economic advantages. In the plant's fifth unit, which has been called upon to become the head one in the new series of AES's with vessel reactors of the water-cooled type, there has been twofold less metal used per kilowatt of nominal power than in the first and second units. In terms of the cost of electric power the Novovoronezhskaya AES already now differs advantageously from many thermal power plants operating on coal and fuel oil.

The fifth power unit was erected, as were the previous ones, by the general contractor--the expert team of the Novovoronezhskaya AES Special Construction Administration. "This was an important final examination for us," says its chief, D. Prozorovskiy. "With the startup of this unit the first industrial AES on the Don has been converted into a major nuclear power complex. It will improve considerably the energy supply of important economic regions of the country's European sector."

At the concluding stage of the work, especially distinguished were the sections headed up by Ivan Yudin and Ernest Islamgulov and the combined crews of Ivan Grechishkin, Ivan Lomakin and Ivan Frolov and of other builders and installers. Many teams, having made a Leninist shock effort in the days before the startup, fulfilled their five-year quotas.

It is significant that in the year of Lenin's anniversary the expert builders and installers of the Novovoronezhskaya AES have been entrusted with erecting a new nuclear power project--the heat supply station near Voronezh. Thus, soon the atom will make a new special labor effort and will warm with its heat the workshops and homes of the oblast's center.

And the giant on the Don, which has already generated for the needs of the country's national economy more than 85 billion kWh of electric power, with new force will truly serve the Soviet people and our friends abroad. The Novovoronezhskaya AES has become a school for training personnel for the nuclear power plants of our sister countries. Every year more than 100 foreign specialists receive hands-on training at its training center, on existing units and the training apparatus.

## FUELS

### GAS-FIELD WORKERS SURPASSING COMMITMENTS FOR 1980

Moscow EKONOMICHESKAYA GAZETA in Russian No 15, Apr 80 p 3

[Article by V. Borison: "On a Shock-Work Drive"]

[Text] "Let us convert 1980 into a year of shock work, of working the Leninist way"—gas-industry workers are competing under this slogan. At the end of last year Comrade L. I. Brezhnev congratulated gas-industry workers for having achieved high goals in a short time and for substantially overfulfilling the tasks of the 1979 plan and of the first 4 years of the five-year plan. In response, all the branch's enterprises are promoting a drive to complete ahead of time the plan for the current year and the plan for the five-year period as a whole.

Gas-field workers are firmly keeping their word. In the first quarter of the year this important branch of industry yielded 8.3 billion cubic meters of gas more than in the same period of last year, or 9.4 percent more. The plan for the quarter was overfulfilled by 2 percent. The rate of labor productivity growth in January-March was 6 percent versus the 3.9 percent of the plan. Goals for gas-condensate recovery, sulfur production, sales of industrial product and other technical and economic indicators were overfulfilled.

Socialist commitments that called for the recovery of 2 billion cubic meters of gas above the plan by the 110th anniversary of V. I. Lenin's birth are being carried out ahead of time. As of 1 April the industry's workers had obtained 1.860 billion cubic meters of gas above the established task.

The Tyumengazprom [Gas Industry Association of Tyumenskaya Oblast] collective has achieved great successes in developing West Siberia's gas industry. During the first quarter gas recovery in this region reached 34.1 billion cubic meters. Gas recovery increased by 31.7 percent here over the same period of last year. At present 378 million cubic meters of Tyumen' gas, or almost one-third of nationwide recovery, are being delivered to the national economy daily. Two strands of the Urengoy-Chelyabinsk trunk gas pipeline, each 1,420 mm in diameter, are in operation.

Compressor stations are being brought to completion. The flow of Urengoy gas will grow still more during the first half of the year.

Collectives of Orenburggazprom, Turkmengazprom and Ukgazprom [gas production associations of Orenburgskaya Oblast and the Turkmen and Ukrainian SSR's] achieved high results in the first quarter's competition. They fulfilled ahead of time the commitments that they had adopted in honor of Lenin's anniversary.

Orenburg gas-field workers are working persistently. Based on the more effective use of existing capacity and on the use of the innovators' experience, the association's collective has recovered 800 million cubic meters of gas above the plan. Workers of Turkmengazprom and Ukgazprom overfulfilled their goals by 513 and 443 million cubic meters, respectively. The workers of Komigazprom [Komi ASSR Gas Industry Association], Noril'skgazprom [Noril'sk Gas Industry Association] and Soyuzuzbekgazprom [All-Union Gas Industry Association of the Uzbek SSR] and other associations also are operating successfully.

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## FUELS

### PROBLEMS IN WEST SIBERIAN OIL, GAS EXPLORATION AND TRANSPORT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Jul 80 p 2

[Article by Academician A. Trofimuk: "Oil and Gas of Siberia"]

[Text] There is perhaps no other type of raw material whose extraction would be so effective and important for society as extraction of oil and gas. Capital investments to the oil and gas industry, despite their significance, are rapidly warranted. And the increase in the specific weight of oil and gas in the country's energy balance by 1% results in an annual saving on the order of 1 billion rubles.

From this viewpoint, the discovery of oil and gas in West Siberia is hard to overestimate. It marked the appearance of a major fuel and raw material complex, for which there are no analogs in the rates of development in world practice: in the last three five-year plans the extraction of oil alone here rose from 1 to 315 million tons. And the fact that in this region about 200 fields of liquid and gaseous raw material have already been discovered and their number continues to rise, graphically testifies that our science armed practice with sufficiently complete methods and resources for searching for underground wealth.

The fields of the West Siberian region are unique in many respects. Thus, for example, the largest of them, Urengoy, is distinguished by such a high concentration of gas in one place, that it makes it possible to create fields that are exceptional in their output. At the same time, the gas that is extracted here is low in sulfur content, and moreover contains up to 99% methane, which significantly facilitates its preparation and purification before transporting.

Of great importance is solid gas. The Siberian scientists have successfully scientifically substantiated that under conditions of permafrost, with low temperatures and high pressures the hydrocarbons are capable of forming with water special solid compounds, gas hydrates. This work affords new potentialities for the use of solid gas, whose large fields have been found in Yakutia in the lower course of the Vilyuy River.

Even more promising are the predictable potentialities of the Siberian earth interior. Until recently, all the main oil and gas fields here were discovered in the Mesozoic deposits that were formed 100-185 million years ago. At the same time, in the opinion of a number of Siberian geologists, the more ancient deposits, Paleozoic deposits are promising; they are over 300 million years old.

The correctness of these predictions was confirmed by the first deep wells made in the south of the West Siberian platform. Now one can already speak with confidence of the fact that according to all geological data of the bed, in the range of depths 2,500-4,000 meters there are supplies of valuable raw materials. This is especially true in the interfluvial area of the Lena and Yenisey.

The fact that Siberia's potential as a supplier of oil and gas is considerable is no cause for doubt. To an equal measure we know the difficulties linked to their development: the majority of the discovered and predictable fields are located in regions with complicated natural and climate conditions, at a great distance from the transportation mainlines, and from the industrial and cultural centers of the country. Swamps, capricious weather, permafrost, and difficult living conditions, and as a consequence, limited labor resources, all of these make the approaches to the resources of the Siberian depths a complex problem that is of exceptional complexity. And it would be erroneous to approach its solution with traditional measures, without a thorough analysis of the outlook.

Today we are standing on the threshold of a qualitatively new stage, the stage of systematic increase in the yield of the Siberian depths. And in this respect we must re-examine the stabilized views on many problems. In order to be able to increase the extraction at accelerated rates in the future, we, figuratively speaking, must know where, what and in what quantities there is. We are obliged to make a good study of our earth interior, and be zealous masters, planning its development. In other words, we must have the possibility of looking as far as possible ahead. And for this the most reliable scientific forecasts must be reinforced by the results of exploratory drilling.

Unfortunately, today's situation is such that the degree of study of the territories that are promising in oil and gas in West Siberia is much lower than on the average for the country. And we cannot even speak of East Siberia. The degree of exploration of the Mesozoic "layer" here is very low, only 0.2-0.3 running meters of wells per square kilometer.

Such a situation can still be classified among the costs accompanying the set-up stage. But in recent years the volumes of exploratory drilling in West Siberia have been growing extremely slowly, and the correlation of supplies is worse than in other oil regions. Why did this happen? It seems that a large role was played by purely subjective reasons. As soon as West Siberia began to gather strength in oil extraction, the search and exploration work began to drop noticeably.

All of these facts often indicate the loss of an outlook and strategic thinking. And the complexity of the current tasks here can hardly be a justification. In particular, one can hardly admit that it is normal that the Ministry of the Oil Industry actually removed itself from exploration in West Siberia, having transferred all the concerns to the shoulders of the Ministry of Geology, that is more poorly equipped with drilling equipment, and has fewer forces and resources.

They can retort that the established order is as follows: the services of the Ministry of Geology are obliged to conduct exploration for a long term, and the Ministry of the Oil Industry--only preliminary exploration before development of a field. Everything is correct, if you do not take into the calculation the acuteness of the current moment: the outlays for the development of natural resources will depend a lot on the degree of exploration of them already tomorrow.

Today, the volumes of exploratory drilling both in the system of the Ministry of Geology and the Ministry of the Oil Industry are roughly the same. But whereas for West Siberia the percentage of the geologists' drilling is about one-third of the total annual well footage, for the extractors it is only one-thirtieth. In other words, the main volume of exploratory drilling in the Ministry of the Oil Industry occurs in other regions of the country where the yield often does not surpass 50 tons per running meter of well. At the same time, in West Siberia this yield reaches 1,000 tons. A simple comparison of these figures forces us to think about an even temporary redistribution of forces.

The formed practice of evaluating the activity of the drilling subdivisions that are doing the exploration cannot help but cause concern. The running meters serve as their main indicator. It is natural that such an indicator makes exploration of deeper Paleozoic deposits unprofitable. At the same time, the development of the supplies of raw material that are predictable here on the whole for a number of reasons would make it possible to continue extraction of already settled, developed regions.

The problems of reliable transportation in this region require a special approach. The periods of navigation on the Siberian rivers do not exceed 4-5 months per year. In winter automobile winter roads are built on the ice-covered rivers and they are used; in a number of places they still are the only means of hauling large and oversized freight. And the majority of automobile roads in Siberia are such that they do not permit the attainment of the necessary speeds, and require great consumption of motor fuel. As a result, the net cost of hauling over them at times is triple that on the roads with solid pavement.

It would seem that the conclusion is clear: Siberia needs modern roads. But their construction here costs quite a lot. Therefore the most economical type of transportation remains the railroad. Thus, hauling of a ton of industrial equipment on the recently introduced railroad from Tyumen'

to Surgut costs 5 rubles, and by truck--350. Therefore, the construction of railroads in Siberia can be considered one of the main factors that accelerates and reduces the cost of development of its natural resources.

It goes without saying that the development of railroad transportation under conditions of the Siberian north can be planned only on the basis of deep exploration of the fields and evaluation of their outlook. This work cannot be fulfilled without aviation, although its use is also expensive. For example, the outlays for shipping a set of drilling equipment 70-100 kilometers roughly equal its cost. But the problem is not only one of transporting drilling equipment without extensive disassembly, more powerful helicopters are needed than those that are presently employed. In the words of the geologists, these helicopters can transport only themselves for great distances, for they carry more fuel than payload.

In this respect, I cannot help but return to the question which has become the subject of acute discussions many times during recent years; I am speaking of the use of such transportation resources as dirigibles and apparatus on an air cushion. The attitude towards dirigibles on the part of the aviation specialists is known, especially negative. I am not able to assert that it is dictated merely by departmental interests; today the development of dirigible construction is equivalent to the creation of a new branch of industry. Moreover, I am ready to allow that the operation of dirigibles is linked to many complications. But we are not speaking of the use of dirigibles in general, but their use under conditions of the region for which there are practically no efficient means of transportation. Moreover, it is already known that there are foreign plans for heavy-load equipment that is a helicopter equipped with dirigible-type cylinders.

The equipment on an air cushion is also complicated. It is paradoxical, but a fact that those experimental models that have been successfully tested under conditions of the Siberian north were created by enthusiasts working ...in the branch of the VNIIneftemash [All-Union Scientific Research and Planning Design Institute of Oil Machine Construction]. Need we be surprised if it turns out that this equipment is far from perfection? But now an almost insoluble problem has arisen: who will manufacture these fairly complicated machines?

The questions raised above are only part of the vast complex of complicated problems associated with the development of Siberia's natural resources. In analyzing these problems it has to be admitted that we still do not everywhere present the correlation of goals for the near and distant future with sufficient depth. In order to avoid in the future the possible miscalculations and losses, on the initiative of the Siberian department of the USSR Academy of Sciences an interbranch complex program of study "Sibir" has been formulated. Its numerous aspects have been studied in detail at the all-union conference on the development of Siberia's productive forces that took place recently in Novosibirsk. It is planned that this program will become the decisive document for the next 20 years.

Speaking at the June Plenum of the CPSU Central Committee, Leonid Il'ich Brezhnev classified the fuel and energy problem among the main questions for the development of our economy. Today the attention of the entire country is riveted on Siberia. The party and government show continuous concern for improving the living and general conditions of the toilers of this region, and sent major forces and resources for its development. But a lot in Siberia's future depends on the personal contribution and the attitude of those hundreds of thousands of people whose work is directly or indirectly linked to its problems.

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## FUELS

### GEORGIAN SSR NATURAL GAS CONSUMPTION NOT PROPERLY CONTROLLED

Moscow PRAVDA in Russian 26 Mar 80 p 3

[Article by I. Kherodinashvili, deputy chief of the Georgian SSR Main Administration for Gasification (Tbilisi): "How to Save Gas"]

[Text] Natural gas consumption is growing. It is being used everywhere—in production and in the household. However, the reserves of the valuable raw material and fuel are limited.

How is the fact that many enterprises still do not economize on gas to be explained? By the fact that mainly the reporting of its consumption has not been introduced there or it is poorly organized, and technical substantiation of utilization norms and goals for saving fuel and heat have not been confirmed. Devices for automatic regulation of the gas-combustion process and heat-recovery installations are absent or in bad repair. In November 1979, 122 enterprises in the Georgian SSR were surveyed. These are the deficiencies that were found.

The Central Committee of the Georgian Communist Party, the republic's council of ministers and the commission that it created for regularizing the supply of fuel, electricity and heat energy are systematically taking the necessary steps. In so doing, problems arise not just on a local scale. There is still no unified document on questions of fuel and heat utilization. So some enterprises do not observe simple rules for the rational and economical use of gas.

A gas installation cannot be released for operation without the authorization of the inspectorates of Gosgaznadzor [State Inspectorate for Gas Installations] and USSR Gosgortekhnadzor [State Inspectorate for the Supervision of Industrial Safety and Mining Inspection]. As a rule, approval is required for the type of fuel burned, the quotas on gas and automation of the safety systems. It would be well to supplement these provisos. Needed, for example, are technically substantiated specific consumption norms for fuel and heat, operating-regime charts and automatic regulation of the combustion process. All this would enable USSR Gosplan and Union ministries and agencies to determine more precisely the resources for and ceilings on gas consumption.

The use of gas as fuel at enterprises is monitored by regional inspectorates of Gosgaznadzor of the USSR Ministry of Gas Industry. Their rights and functions have been restricted. Would it not be better to include them in the USSR Gostekhnadzor system?

Questions of allocating supplies and setting norms for gas consumption intended for the populace's needs also have not been solved yet. The existing norms are out of date. Actual consumption is much higher than computed. In Georgia, for example, the difference reaches more than 500,000 cubic meters each day. This is equal to the daily norm for several enterprises that convert primarily to reserve fuel during the period of restricted gas delivery. Such a situation creates difficulties in regulating gas-supply regimes in the gas-line grids, especially during the winter. Actual norms for distributing gas to the population in various regions must be reviewed and approved more quickly.

In the winter, as is known, enterprises pay more for gas that they consume above established ceilings. Experience has indicated that this measure is no longer adequate; stricter sanctions are needed. Obviously, it is necessary to develop a state standard or a legislative statute that will define a precise procedure for converting national-economic facilities to gas and for the distribution of supplies for the main and reserve types of fuel and will establish rules for introducing an installation into operation.

At one time, when natural gas was used mainly for household needs, gas activities were included in the consumption sphere. Now this fuel is supplied to industrial and power enterprises. And our subunits are, of course, a component part of the production sphere, just like power, railroad and automotive transport systems. But the varied structures of gas activities in the republics (main administrations, state committees and production associations) and a lack of the requisite coordination among them prevents the execution of a unified engineering and economics policy on the use of gas.

A timely, well-thought-out solution of the problems designated in this letter will enable the country's fuel and power resources to be used more effectively.

11409

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## FUELS

### URENGOY GAS PIPELINE NEARS GAS RING AROUND MOSCOW

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 May 80 p 1

[Article by L. Borisov (Moscow Oblast): "Siberian Gas to the Moscow Region"]

[Text] The Moscow region is again becoming the springboard for a most huge trunk pipeline construction project. West Siberian gas will come to the capital's oblast from faraway northern Urengoy, through the Arctic Urals mountain range, Ukhta and the small Vologodskaya Oblast town of Gryazovets. Simultaneously, the Torzhok-Minsk-Ivatsevichi line is being laid down from Gryazovets. The new gas-transport system, which opened up still another route for flow of the highly effective fuel from the Tyumen' gas and oil producing region, will be extended by more than 4,400 km.

Next year Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] builders should introduce the whole system, including 26 high-powered compressor stations, communications and electric-power lines, housing and other facilities, into operation. Now 1,328 km of trunk pipeline, including 457 km on the Gryazovets-Moscow Gas District Ring section is to be turned over to the operators.

...A circumferential gas pipeline encircles the capital's outlying cities, which stretch out for several hundred kilometers, with a giant steel hoop. Like rivers into the sea, long-distance pipelines pour into it. From Stavropol', Central Asia, Medvezh'ye....The ring also gathers gas streams from Dashava and the Volga region.

The gas ring, together with its numerous compressor and distribution stations, plays the role of a regulator in the country's Unified Gas Supply System, directing streams of fuel to cities, enterprises and electric-power plants of the central industrial region.

In order to guarantee that the ever-increasing demand for gas will be met, it was decided to lay an additional transport artery to the Moscow region from Gryazovets, to which several strands of pipeline of the existing transcontinental Urengoy-Gosgranitsa SSR [USSR State Border] system previously had been brought.

...It is Moscow's suburban settlement of Zhilino. It is early on an overcast morning. Rain and snow are falling from the low-hanging sky. But the welding base is heavily populated and busy. Tractors and motor vehicles rumble. Assemblers of SMU-1 [Construction and Installing Administration No 1] of Ryazan'truboprovodstroy [Trust for the Construction of Pipelines in Ryazanskaya Oblast] are assembling the special trestle full blast. The final 42-km long section of the pipeline has been entrusted to it. After crossing rivers and streams, canals, railroads, highways and cable and high-voltage lines and passing through forests and hills, this unusual construction site requires much labor for its fruition. That is why precise mutual actions of all those working together on it are especially important.

The nearest railroad yard to Zhilino is Kryukovo. Each day trains come here with pipe. The truck-crane operators and pipelayer-operators of the brigades of Ivan Sinyakin and Vasiliy Dudin unload it continuously. They work amicably and efficiently. As if by conveyor, the unloaded pipe is delivered to the trestle by Aleksey Tikhonov's columns of pipe carriers. A. Tikhonov has no little experience. During long years of work on Siberian lines, he has learned how to conquer the most difficult roads. And here in an outlying region of Moscow he has already hauled more than 23 km of pipe. This is a reserve large enough for roll welding full blast for 3 shifts.

The Ryazan'truboprovodstroy collective decided to compete with its colleagues from Voronezhtruboprovodstroy, Kuybyshevtruboprovodstroy and Bryansktruboprovodstroy [pipeline construction trusts of Voronezhskaya, Kuybyshevskaya and Bryanskaya oblasts], Shchekingazstroy [Shchekino Gas Industry Construction Trust] and the welding and assembling trust. These collectives also undertook to establish welding bases, to build field settlements and to deliver construction and installing equipment to the sites. Roll welding has been promoted in four of the six trusts engaged on the Moscow-region route. About 50 kilometers of pipe lengths have been prepared.

According to the design, it is planned to organize 11 integrated construction and installing flow-line operations groups on the new route. Each of them has been called upon to turn over completely finished segments of the arterial in turnkey style.

Minneftegazstroy construction workers and installers are doing everything possible to carry out with honor the party and government decree about speeding up development of the West Siberian oil and gas region, an important element of which is erection of the Gryazovets-Moscow District Gas Ring pipeline.

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## FUELS

### HUGE WALKING EXCAVATOR ASSEMBLED AT AZEY STRIP MINE

Moscow TRUD in Russian 15 Jun 80 p 1

[Article by V. Grabok (PUT' K KOMMUNIZMU correspondent) and G. Volovich (TRUD correspondent) (Tulun, Irkutskaya Oblast): "The Giant of the Azey Coal Strip Mine"]

[Text] The country's largest walking excavator of Ural-mash has started work at the Azey Coal Strip Mine.

The Siberian town of Tulun is observing its 300th anniversary now. When the first Russian people settled here with their huts alongside the yurts of the local residents, it did not enter anyone's head to ponder why these Buryat nomads named their settlement Tulun, which means "sack." Only many years later did the geologists discover the symbolic sense of the name: Tulun is a sack full of coal.

Now the Azey strip mine, the greatest in East Siberia, has been spread out over Tulun's coal, giving the country annually millions of tons of the cheapest fuel, which does not need preparation but is sent directly from the mine face to the customers. And the mining machinery is a match for the gigantic enterprise: 25-cubic meter excavators that strip rock mass and rotary cutter-loaders that simultaneously gnaw at the coal seam and load railroad trains.

A conference that was held recently in Irkutsk on development of the region's productive forces during the forthcoming decade, called for further growth of Azey—to increase its capacity to 15 million tons of coal per year. And one of the main points of the program for augmenting the strip mine's equipment is the assimilation of a new machine—a walking excavator with a bucket capacity of 40 cubic meters.

It is difficult to name this gigantic machine and vehicle. A year ago Azey chief engineer Yu. Shchapov showed us the assembly site—it gave the impression that a plant was being built. And even now, when they have removed the scaffolding, and the bulky orange-colored thing that weighs 3½ thousand tons, walking slowly, has taken up its position at the mine face, the impression has not been dissipated: it is actually a plant, a

machine-plant for doing mining work. The area of the service premises here is 750 square meters. The mechanical department is equipped with a single-rail overhead crane. In order to activate all the motors of the dragline simultaneously, an amount of electricity is required that would be enough for 100 100-unit apartment houses. But the most remarkable thing is the shovel. One of its bites is enough to load up a railroad car. True, the excavator's mission is not at all associated with loading--it is to strip overburden from the coal seams.

Experienced miner V. Gusevskiy was put in charge of the giant machine's collective. The brigade took part, along with the assemblers, in assembling the machine, it made a detailed study of the components and mechanisms, and it listened to a theoretical course that was organized by Uralmash specialists.

"The new machine is not simply an enlarged copy of previous machines," says Vladimir Pavlovich, "it is basically different--there is an electronic control system here. In front of the operator is a panel with instruments and buttons, like in an airplane. Likewise, attentiveness and alertness are needed no less than by a pilot. And there is still another circumstance: the designers were very much concerned about working conditions. Two spacious operator cabs, a wide view, convenient soft seats, excellent heating, and a stove on which a breakfast can be warmed....

Gusevskiy has a good school behind him. As a first-class operator he grew up in the brigade of Distinguished Miner and USSR State Prize Winner A. K. Plynskiy, who also works here at Azey, guiding a 25-cubic meter excavator.

The crew of the new walking machine, which is the standard bearer for domestic mining equipment, gave its word to master its design capacity by the end of the year, and then the ESh-40/85 will take on itself a fourth of all the strip mine's stripping operations--this is 6½ million tons of rock thrown onto the dump.

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## FUELS

### KANSK-ACHINSK FUEL-ENERGY COMPLEX DEVELOPMENT PROBLEMS

Moscow TRUD in Russian 27 Jun 80 p 2

[Article by L. Sizov, second secretary, Krasnoyarskiy Kray CPSU Committee: "Siberia's Fuel Base"]

[Text] KATEK -- this name is familiar today not only to Siberians. In the "Principal Directions of Development of the USSR National Economy in 1976-1980," ratified by the 25th CPSU Congress, considerable attention is devoted to development of the Kansk-Achinsk Fuel-Energy Complex.

In the report by CPSU Central Committee General Secretary Comrade L. I. Brezhnev at the recently-concluded CPSU Central Committee Plenum, the fuel-energy problem is specified as one of the key problems of development of our economy. Therefore KATEK, its formation, and efficient exploitation of the coal resources of this area occupy a leading position in this country's fuel-energy balance.

Calculations indicate that in the future KATEK will mean 350-400 million tons of coal per year, approximately 60 million kilowatts of installed generating capacity, and more than 280 million kilowatt hours of generated electric power. Is this a large or small figure? Let us compare. For coal it comprises one half of this country's current total production. In installed generating capacity it represents the total generating capacity of all our electric power stations in 1957. In production of electricity it equals the total production of all this country's electric power stations in 1959.

And according to plans, when KATEK reaches full output, production may total 1 billion tons of coal and 100 million kilowatts of electric generating capacity. We can state boldly that such a fuel-energy complex is unique in the history of the world.

Major documents pertaining to establishment of this complex were adopted in March of last year: CPSU Central Committee and USSR Council of Ministers decrees entitled "On Establishment of the Kansk-Achinsk Fuel-Energy Complex" and the USSR Council of Ministers decree entitled "On Initiation of the Job of Building the Kansk-Achinsk Fuel-Energy Complex."

These important decisions marked a new stage in establishment of KATEK and utilization of its riches.

Slightly more than a year has passed. We can already state some results of implementation of these decrees, extracting the first lessons, so to say, from the experience of building and shaping the complex.

Today the main task of all KATEK construction workers is erection of the first GRES — Berezovskaya No 1. Its first turbine-generator unit should come on-stream in 1983. But in order to ensure startup of this first unit, it will be necessary to accomplish a considerable volume of work at literally all facilities of the complex.

Of course much has already been done. For example, the master plan for the Sharypovskiy industrial center has been drawn up and approved, as has the master plan for development of the future urban center of KATEK and a draft of the detailed layout of its central area. The participants in building this complex have signed a productive cooperation agreement. New construction organizations of the USSR Ministry of the Coal Industry -- the Katekuglestroy Combine, and of the USSR Ministry of Power and Electrification -- the Katekenergostroy Trust, as well as a subdivision of the Ministry of Transport Construction have been formed.

The volume of scientific research on problems pertaining to building and managing the complex as well as environmental protection has also grown. Today research activities involve scientists from Moscow, Leningrad, Novosibirsk, Kiev and other Soviet cities. KATEK is a component part of the Siberia Program of the Siberian Department of the USSR Academy of Sciences.

But let us more closely analyze progress of work on building the complex. We shall begin with a problem which at the present time is perhaps the most acute, that of building a new city, the future urban center of this complex.

I shall not be giving away a secret if I state that a great deal in the fate of this complex depends on whether people settle down here on a permanent basis, for precisely now, at the initial stages, it is extremely important to establish capable and efficient work forces here, sharply to increase the output capacity of construction organizations and to establish appropriate facilities for them.

Accomplishment of this task is determined by the pace of housing construction. This construction project has been declared an All-Union Shock-Work Komsomol project. Recently the first all-union shock-worker detachment, "Molodogvardeyets," arrived in Sharypovo, and another will arrive in the fall. By 1982 the new city will have a population of more than 70,000. In order to ensure startup of the first generating unit on schedule it is necessary, according to the most modest estimates, to have not less than 600,000 square meters of living quarters, plus all requisite social and

cultural services facilities. What has been accomplished? Very little, since the beginning of construction the Katekenergostroy Trust of USSR Minenergo [Ministry of Power and Electrification] has completed for occupancy slightly more than 30,000 square meters of housing, and they are also considerably behind schedule in completing social, cultural and personal services facilities.

One of the reasons for this situation is poor supply of housing construction components. At the present time they are coming from ministry enterprises which sometimes are located hundreds of kilometers from the complex. Minenergo sees this as the objective reason for poor supply deliveries and does not promise a radical improvement. But at the same time it is extremely slow about settling the matter of establishing in the KATEK zone a local housing construction base. It was only in April of last year that the ministry agreed to establish in the town of Nazarovo, based at a ministry plant, a new facility to fabricate components for large-panel buildings. It is not hastening, however, to implement its decision. Technical-economic substantiation of production is not completed, and the construction project was not placed in this year's plan. As a result housing of obsolete series which are unsatisfactory to the new tenants is presently being erected in the future urban center of KATEK.

The coal miners are also making their "contribution" to the failure to meet the housing construction schedule. Last year the Krasnoyarskugol' Association failed to submit on schedule documentation for construction of a new community designated for the construction workers on Berezovskiy Strip Mine No 1. Naturally this had a serious effect on progress in construction of the mine itself.

Mintransstroy [Ministry of Transport Construction] also must resolve major problems pertaining to construction of facilities in this complex. Judge for yourselves: at least 2,500 freight cars daily will be required just to haul coal from Berezovskiy No 1. The transport construction workers have a lot of work ahead of them: in addition to building new spurs to the facilities of the complex, renovation of existing and construction of new rail yards, in a number of sections they must lay second and third tracks. Only if this is accomplished will it be possible to ensure that Berezovskiy coal reaches Western Siberia.

The ministry, however, is obviously in no hurry about executing this program. It was not until the beginning of this year that the ministry made the decision to set up a construction work train here. But it has not yet been supplied with equipment and is not really ready to go to work. In the current year this ministry included in the plan only one third of the work volume it was to accomplish at the complex in the course of the year. A similar situation prevails with the construction of paved roads. The need for these roads is enormous, but the RSFSR Ministry of Highways refuses to build them, claiming inadequate production facilities.

We are also concerned by the problem of environmental protection, which is of fundamental importance in the development of KATEK. It is projected that the total acreage to be allocated for the needs of the complex up to 1990 will total at least 8,500 hectares. And it is not only the fact that gigantic strip mines will occupy considerable amounts of fertile land. This acreage cannot be effectively restored to its original condition by conventional, traditional methods. It is proposed that exhausted strip-mine acreage be filled in at the same time as coal is removed. This is unquestionably an advantageous method and requires thorough study and testing. It is our view that as soon as work begins at the first strip mine, a special recultivation service be set up and furnished with high-output equipment. The operating experience of such a subdivision at the first strip mine can later be utilized in the operation of subsequent mines.

The situation is more complicated as regards recovery and storage of waste from the GRES -- ash, clinker, as well as overburden. This problem is not yet adequately resolved, and once again due to ministerial barriers. USSR Minenergo cannot reach an agreement with the union ministries of the coal industry and construction materials industry on a uniform approach to solving this problem.

One of the important problems pertaining to development of the complex is that of securing a sufficient quantity of foodstuffs for the people residing there, for by 1990 the population will have increased 10-fold. And the majority will be residing in cities and towns. There is only one solution -- establish a food-production base at an accelerated pace. It will also be necessary to alter specialization of agriculture, for traditionally these regions have been primarily grain-producing. But it will be necessary to build in this zone new dairy products and meat-producing facilities, large-scale poultry farms, and to produce vegetables. Such a program has been drawn up for this area. The plan calls for potato production in the KATEK rayons to increase 2.6-fold, milk production by 35 percent, meat production by 38 percent, and egg production by 51 percent by 1985. Substantial funds will be required in order to accomplish this task. In our view all involved ministries and agencies must do their fair share of participation in implementing this program and determine specifically what facilities they can build.

The success of this complex depends in large measure on the degree of precision and coordination of all agencies participating in its development. Practical experience indicates, however, that at the present time such precision is frequently lacking even in the subdivisions of a single agency. For example, Minenergo has three management entities involved in construction of KATEK: at Berezovskaya GRES No 1, at the town construction project, and at erection of the construction industry base facilities. Each is subordinate to a different main administration. In connection with project development here, plans call for setting up an additional several power industry subdivisions. And once again subordinate to different main administrations. Would it not be better, for their administration and management, to establish a single ministerial coordination center? A single management unit for KATEK facilities under construction, for example.

But even this is only half the solution to the problem. Analysis of initial results of work on building the complex clearly shows that a single unified agency of authority is needed for more precise coordination of the actions of all related or associated entities. The decisions of this agency should be binding on all entities participating in the project. Four years ago TRUD stated the necessity of having such an agency. It is true that some things have been accomplished. The Systems Research Institute of the USSR State Committee for Science and Technology worked on problems of management, establishment and functioning of the complex. But these are only first steps. We believe that such a management-administrative center should be as close as possible to the complex. This is especially important now, when more and more new participating entities are entering into a cooperative agreement pertaining to building KATEK.

Naturally we fully understand that building such a gigantic complex as KATEK is an extraordinarily complex affair. Therefore the first lessons learned in the course of its establishment should not be wasted. They should teach us a great deal and help us find new ways and marshal additional reserves.

The entire Soviet people is presently beginning preparations for the 26th CPSU Congress. It is our common duty to do everything in order honorably to perform the tasks assigned by the party.

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CSO: 1822

## FUELS

### SUPER STRONG PIPE FOR OIL LINES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 May 80 p 1

[Article by R. Akhmetov, based on interview with Professor P. Borodavkin: "Ultra-Strong Pipelines"]

[Text] The diameter of crude oil pipelines is today ceasing to be the deciding factor in increasing the transmissive capacity of trunk pipelines. Today the pipe strength factor is the most important.

"It is precisely by this route, by continuously increasing pipe reliability, that we can substantially increase pressure in trunk pipelines, and this means a sharp increase in flow of crude," stated Professor P. Borodavkin, a leading expert at the Moscow Institute of the Petrochemical and Gas Industry, emphasizing the importance of this problem. "In the current five-year plan Siberian crude oil production will more than double, while natural gas production will increase 4.5-fold. This will face fuel transport experts with a task of enormous importance. We have in all probability reached the limit in increasing diameter. Theoretical calculations, backed up by practical experience, indicate that a pipeline 1,420 millimeters in diameter can be considered the most efficient through the coming decade.

"The principal demand presently being made on us by the pipeline operation people is that we achieve a sharp increase in pipe strength with the existing pipe diameter. The institute staff has made substantial progress in this area. We have completed scientific-engineer substantiation of an engineering design for an ultra-strength pipeline for transporting crude oil and natural gas in Western Siberia and the Far North. It constitutes a pipe within a pipe, with the annular space filled with concrete. With this design the inner pipe, as laboratory tests have shown, is capable of withstanding double the normal pressure — up to 150 atmospheres. The volume of transmitted gas almost doubles, while the volume of crude oil increases by approximately half.

"Such pipelines will first of all be indispensable on the most difficult sections of a route running along a river bottom or shelf, and in tundra. Swamps and marshes are a dangerous enemy of Siberian pipeline builders. Work is conducted only with the onset of freezing weather: ditches are dug, pipe is laid, and the pipelines are weighted down with reinforced concrete weights. This is essential, for in the spring the bogs thaw, and the pipelines could float to the surface and rupture. Up to 2,000 tons of reinforced concrete weights are employed per kilometer of pipeline. Our pipeline does not need weighting down. The concrete contained in it prevents floating to the surface. Three-ply pipe will make it possible to construct oil and gas pipelines on permafrost ground -- in this instance the concrete also serves as an effective insulating material."

"How is your new innovation being adopted?"

"A 4-kilometer pipeline crossing will run across the Kuyal'nitskiy estuary on the Black Sea. The institute is setting up a small experimental section near Moscow, which will become a field laboratory. Our institute's scientists hope that the regions of Western Siberia and the Far North will become the next proving ground for practical adoption of our new innovation."

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## FUELS

### OIL WELL DESIGN; VARIABLES REPORTED

Moscow NEFTYANOYE KHOZYAYSTVO in Russian No 6, Jun 80 pp 8-9

[Article by L. P. Guzhnovskiy, with the Institute of Economics and the Program Planning Division, Siberian Department, USSR Academy of Sciences, and M. Kh. Khasanov of the West Siberian Scientific Research Institute of Geological Prospecting for Petroleum: "Calculation of Stochastics in Designing Systems for the Arrangement of Oil Fields"]

[Text] An analysis of work done on the arrangement of oil fields in West Siberia disclosed many instances of lag in the construction of individual installations, this caused by changes in the initially assigned design level for the extraction of oil. Characteristic of West Siberia was a constant increase in the design level of extraction, this connected with alterations to systems for oil field development. In turn, this resulted in the allocation of additional capital investment funds for the adaptation of design decisions to new extraction conditions.

From this it follows that the designing of oil field arrangement and the making of technological calculations in working out the substantiation for the development of oil fields should go hand in hand with the calculation of the reliability of design decisions (1). What should be taken into consideration is the fact that the greater the potential possibilities for intensification (the gradual accumulation of the extractive possibilities of systems, expressed in the surpassing of the current debit of systems over the initial momentary debit) which the system for development possesses, the more reliable it is. We note the fact, for example, that the transformation of a five-row system into a one-row system doubles its intensivity while increasing its area by 2.3 times. The calculations conducted attest to the reserves built into available developmental systems upon their intensification. In order to make use of them, additional expenditures are required, primarily of capital investment funds in systems for the collection and transportation of oil, in the maintenance of strata pressure, etc.

In connection with this, during the early stages of designing it might be expedient to make technical-economic calculations as to the justification of arrangement designs, calculations which would figure in possible

extraction changes. Indicators as to the reliability of expenditures with their figures as to adaptation can be utilized for the evaluation of variations (3).

The reliability of the project is the potential probability of the fulfillment of decisions contained within it as to volumes and as to schedules for achieving the maximal possible level of oil extraction in conformity with technical-economic indicators, as well as realization of the fundamental directions of scientific-technical progress which are embodied in the project. Let us use the quantity  $H_i$  as the symbol for the reliability of expenditures, this characterizing the relative deviation of its mathematical expectations for adaptation of variant  $i$  to variant  $v$ :

$$H_i = 1 - \frac{\sum_v P_v \Delta K_{iv}}{K_i} \text{ WITH } \sum_v P_v = 1,$$

where  $H_i$  is the reliability of expenditures for arrangement variant  $i$ ;  $\Delta K_{iv}$  and  $P_v$  stands for the additional expenditure of capital investment for the adaptation of variants and the probability of their achievement;  $K_i$  stands for the capital investment for variant  $i$ .

Such an evaluation presupposes the availability of different technological variants of varying intensity. In practice, the formation of variants is a complex matter, inasmuch as the time factor creates a wide range of possible alternatives. Therefore, we will consider any number of variants which describe the possible future status of systems for development and which differ from one another as to stages of development, structural elements, productive possibilities and expenditures for their attainment.

Let us consider one of these systems—a system for the oil field arrangement of individual fields or deposits. Each system is intertwined with a technological scheme of development which describes the general technical-economic characteristics of installation management—an oil deposit. Changes in the management of the deposit, therefore, such as for example the achievement of a higher design level in the extraction of oil, occur when these technological schemes are altered; this is possible as a result of the completion of prospecting work on the site during the process of exploitation of the deposit.

Changes occur also as a result of the intensification in the development of sites. Our experience in the designing of these systems shows us that possible changes in their productivity, within definite limits, can be found. Thus, the density of the network of oil wells as an average for West Siberia varies from 64 to 9 hectares per well, whereas these limits might differ for various sites.

At high debit sites, for example, in changing the well network from 81 to 25 hectares per well, this debit changes from 71 to 30 tons per day, there is a 2.5 increase in the volume of oil extraction. At low debit

sites, where the density of the well network varies from 36 to 16 hectares per well, the debit changes from 27 to 22 tons per day, while the volume of oil extraction increases by 84 percent.

Our calculations show us that, in order to achieve such changes in extraction dimensions, additional capital investment funds are required not only for the drilling of concentration wells but also for the creation of additional capacity at installations of petroleum arrangement. Thus, it has been noted that changes in the technology of development at high-debit sites have been accompanied by additional capital investment in various subsystems (of 75.8 percent in stock inventories; of 200 percent in oil processing; and of 240 percent in purification structures).

Such forced expenditures for the creation of additional capacity of petroleum arrangement could possibly be lower (by two times in stock inventories, by 40 percent in oil processing, and by 65 percent in the creation of purification structures) if these technological changes had been considered at various stages of the design work done on installation management, this through the reservation of capacity.

Modern systems of installation management, however, are designed practically without any consideration of possible changes in the volume of extraction. Consideration of these possible changes, moreover, is especially important in long-range planning.

It is necessary, therefore, to provide rational limits to the reservation of capacity at installation management facilities. In order to resolve this task in conformity with the approach which was set down in our work (3), it is necessary to know the reliability of capacity changes. An aggregate of various factors influence changes in the capacity of specific oil processing installations. These include chance changes, i.e., the change in capacity is a chance variable with a definite function as to distribution by reliability.

An analysis as to the changeability of technological schemes for the development of the oil installations of West Siberia provides certain concepts of the magnitude of the changes in capacity of installation management. Thus, oil extraction at the Zapadno-Surgutskoye site, in accordance with the technological scheme of 1972, was 53.4 percent higher than was projected in accordance with the scheme of 1966; at the Samotlorskoye site, according to the "Complex Technical Scheme for Development" of 1975, it was 20 percent higher than the "Principal Scheme" of 1971. Out at the Mortym'ya-Teterevskoye site (the main deposit), the projected extraction was also increased by 20 percent, while that of the Trekhozernoye site was increased by 11 percent, and that of the Megionskoye site was increased by 25 percent, etc.

In order to determine the reliability in changes in the projected level of oil extraction in five year time segments, it is rational to set down

the beginning of the development of an oil site as one moment of time and to look upon the frequency of changes in these indicators in some sort of time interval:  $t_1$  is equal to (0-5),  $t_2$  is equal to (5-10) and  $t_3$  is equal to (10-15). The frequency of hitting each of these time intervals in the development period under review provides us, at first approach, with a quantitative expression of the reliability of changes.

As a result of the analysis of design data, we have derived the reliability of changes in technological indicators ( $R_1=0.3$ ;  $R_2=0.5$ ;  $R_3=0.2$ ), with the average significance of changes in the volume of oil extraction  $\Delta Q_1=139$ ,  $\Delta Q_2=141$  and  $\Delta Q_3=185$  percent in relation to initial data. The average significance of parameter changes and their probable characteristics thus derived should be considered as tentative.

For a more detailed description of the regularity of changes in the technological parameters of oil processing, it is necessary to classify them by factor: natural factors, which are connected with changes in geological-oil field information, and management factors, which are connected with requirements for the intensification of oil extraction for a variety of reasons.

Under the existing selection of sites, however, the choosing of deviations by factor is becoming even less representative and any judgement as to the reliability of changes in the parameters of development even less objective. Under these conditions, the reliability of these or of other deviations acquires an ever more indefinite character, which conforms to the condition of equal probability of parameter changes.

There can be detected qualitative differences in the size of structure and debit of oil field exploitation, these having an influence upon potential possibilities for changes in technological parameters. The reliability of subsequent changes for large installations is greater than it is for small installations.

A more fundamental criteria of effectiveness is the reliability which, under conditions of full uncertainty as to changes in technological parameters, takes the shape of capital investments for capacity adaptation. Preliminary calculations show that utilization of equally probable parameter deviations facilitates the selection of variants with reserve capacities in such management subsystems as the processing of oil, stock inventories, and purification structures. Under other conditions which are equal, the reservation of capacity would substantially increase the reliability of capital investment expenditure: by 20 percent in the processing of oil, by 30 percent in flooding, and by 50 percent in purification structures.

The task of capacity reservation is a regional one, inasmuch as it is tied in with the distribution of resources, particularly, capital investment. Therefore, it can be resolved as an optimizing task (on the level

of the oil extraction area) under processing technological variations, i.e., together with consideration of various oil well concentration grids. Existing models of optimization of oil industry development, as for example (4), do not take into consideration the adaptiveness of oil field management installations. Modernization of these models for the purpose of improving the calculation of technological parameters in connection with oil well concentration grids can improve the decisions derived therefrom.

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## FUELS

### MAINTENANCE OF WELLS AT OPTIMAL OPERATING CONDITION STRESSED

Moscow NEFTYANOYE KHOZYAYSTVO in Russian No 6, Jun 80 pp 58-59

[Article: "Oil Well Repair--On A High Level"]

[Text] Persistent and painstaking work on our oil wells holds central place in measures conducted by the oil industry for the effective use of productive capacity, for increasing the productivity of labor, and for the conservation of material and labor resources. It is upon this that the main attention of our labor collectives, of those involved directly in the extraction of oil, is concentrated. Over the years of the past five year plans, the number of wells has increased significantly and at the present time totals more than 93,000. Of these, 77,400 wells are providing oil, 1,394 are producing gas, and 14,400 are used as injection wells. All of these wells determine (directly or indirectly) our capacity for the extraction of oil and gas.

The task of facilitating oil and gas extraction is tied in closely with the maintenance of our wells at optimal operating condition. Wells which require the greatest expenditure of manpower for repairs to keep them in operating condition are wells for the mechanized extraction of oil, which comprise 85.5 percent of the total while producing 48.6 percent of the total amount of oil. Engaged in this work of maintaining our wells in operating condition are 1,053 brigades which are doing underground maintenance plus 970 brigades which are doing major repairs. The men of these brigades carried out 228,400 maintenance and 20,200 major repair jobs on wells in 1979.

The USSR Ministry of the Petroleum Industry has attached particularly important significance to the further improvement of the organization and technical provision of well repair and in March of 1980 held a conference of underground and capital repair brigade foremen--winners of the 1979 All-Union Socialist Competition. Ye. I. Bukhalenko, Deputy Chief of the Administration for Development of Technology, Engineering and Organization of Oil and Gas Extraction, delivered an address on the status and tasks of improving the repair of wells, telling participants in the conference of measures which had been taken aimed at raising the level

of providing equipment to repair brigades. He also spoke of the experience of foremen who have distinguished themselves in their work, people such as A. G. Basyrov, A. S. Prokayev, R. G. Fayzullin, M. D. Myndyuk, O. Garayev, V. P. Zadorozhnyy, A. F. Sinchurin, I. I. Dunayev, I. G. Galiyev, and others who have achieved the very highest of indicators through their skillful organization of work, application of leading technological examples, and best usage of repair equipment. Together with this, the speaker noted shortcomings in the work of the repair services, pointing in particular to the fact that, in the year just past, functioning wells stood idle about 8 million hours and were inactive for 18 million hours in expectation of repairs. Repairs which had to be repeated because of poor quality work comprised 2 percent of the repair work done in our branch of industry; in individual areas, the figure was much higher: at the Surgutneftegaz Association, it was 12 percent, at the Nizhnevartovskneftegaz Association it was 10 percent, at the Kuybyshevneft' Association it was 7.3 percent, and at the Permneft' Association it was 5.3 percent. Booster pump (ETSN) components were particularly the objects of repairs which had to be done over again. In individual areas there has been an increase in the average duration of repairs, a deterioration in the structure of the working time balance of brigades, and a decrease in individual brigade performance.

The speaker went on further to point out that, in 1980, in order to facilitate the extraction of oil as planned, it is necessary to place 7,117 wells into operation, to shift 2,628 wells over to mechanized extraction, and to restore 2,378 inactive wells to operation. This assignment places upon the shoulders of production association repair services even more responsible tasks, the resolution of which must be accomplished by increasing the productivity of labor.

Leading brigade foremen who spoke at the conference shared their achievements and work experience and put forth many valuable proposals on methods for improving and accelerating the repair of wells. The speakers were of one mind that the certain and necessary condition for success consists of the proper organization of socialist competitions between brigades and of orientation upon qualitative indicators and high end results. Together with quantitative indicators, brigades and shifts are adopting obligations aimed at increasing the period between repairs in the operation of wells, of lowering the costs of repairs, of expanding the work of rationalizers, of conserving fuel and energy, and of mastering combined professions.

Their results of these competitions will be evaluated by councils of foremen (as at the Embaneft' Association), by councils of workers' honor (as at the Ukrneft' Association), and at meetings of repair shops.

Foremen M. Anshibayev (of the Embaneft' Association), R. G. Fayzullin (of the Bashneft' Association), G. Kh. Khussanov (of the Tatneft' Association) and many others singled out the most important link in their work as the correct organization of labor, maintaining the constancy of brigade and shift membership, plus strict discipline. Particular attention

here is devoted to both timely and careful preparation of wells prior to the arrival of repair workers. In advance, the foreman studies the traffic flow and the well which is to undergo repairs, discusses with his brigade the particulars of the forthcoming work, and concerns himself with the delivery to the well of everything necessary for the replacement of pipe, rods, pumps, and components. Included within the concept of rational organization of labor is the combination of professions, inasmuch as many workers have a mastery of contiguous professions. Also applied is the parallel fulfillment of capital repair work at two wells. The better brigades are more solicitous about the care of their equipment, which they manage to repair in time and through their own efforts and which they protect from damage in transport.

Foreman G. Kh. Khussanov devoted the greater part of his speech to the development of tutoring, to the transmission of one's experience to young workers. Youth with secondary and secondary special educations and with a good theoretical background come out to the oil fields and encounter a variety of work aspects which require a great deal of practical experience to resolve. In connection with this, many foremen expressed themselves as to the need for the study and for distribution among young workers of the rich practical experience of older workers and for expansion of sponsorship of brigades composed of young workers.

Foremen-comrades R. V. Akhmediyev, I. D. Voytovich, A. S. Prokayev, V. I. Shabolkin, I. D. Budyuk and many others commented on the insufficiently high quality of the mechanized wrenches, instruments and hoisting devices. These are often delivered with great assembly defects and require 1-1.5 months to place in operating condition through the efforts of the brigade itself. On the "Bakinets" units, it is the gear box which frequently goes out of order. Many worthwhile proposals made by the brigade as to improving the design of KMU and ASHK-T hoisting units and mechanized wrenches are not heeded by plant-manufacturers. Especially alarming are the defects of deep-well pumps (SHGN) and of booster pump (ETSN) units. Quality of the deep-well pumps (SHGN) decreased noticeably in 1979; there are gaps in the threaded connections and the temperature valves do not work. Along with this is the fact that, at oil fields, work aimed at the reclamation of such equipment is poorly organized. Nor has the repair of pump and compressor tubing been initiated everywhere.

Little attention is being devoted to the transport needs of underground and capital repair brigades. They are the last to be allocated motor vehicles and tractors. Also poorly organized is the problem of getting shift workers transported to their jobs. Because of the irresponsibility of transport organizations, repair personnel often cannot arrive for their shifts on time or to get back for their rest periods.

Many justified complaints were expressed as to the questions of the supply of special clothing and to putting order into the system of material stimulation. In certain regions, repair personnel are being poorly

provided with housing; nor are the necessary cultural-living conditions being created for them.

The experience of leading brigades in the repair of wells is convincing testimony of the significant reserves which we possess as regards improving labor productivity in this field. It is necessary to make this experience in the work of leading brigades accessible to everyone in a very short time. Along with this, sufficient attention should be paid to the needs of the repair services, people who are in the forefront of the struggle for oil.

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## FUELS

### NERYUNGRI COAL MINE DEVELOPMENT

Moscow IZVESTIYA in Russian 20 Jun 80 p 1

[Article by E. Rybakovskiy, Yakutsk: "First Million From Neryungri"]

[Text] A rail consist loaded with the millionth ton of coal produced since the beginning of operations at the Neryungri strip mine has left Ugol'naya yard -- terminal point on the Lesser BAM.

Having achieved this target, the miners of Southern Yakutia have met their socialist pledge two months ahead of schedule. There are few coal basins anywhere in the world which can contend with Southern Yakutia in coal reserves. Picture an area of 25,000 square kilometers "larded" with seams of black gold. More than 90 percent of the coal bedded here is coking-quality, without which blast-furnace steel production is impossible, as we know.

According to geologist prognoses, nature has "hidden" in Southern Yakutia 40 billion tons of fuel. Justly called the pearl of the basin is the Neryungri field, containing reserves of almost half a billion tons, and which is already producing. One of the nation's largest coal complexes is being established, based on this field. It will include a strip mine operation with an output capacity of 13 million tons, a dressing plant, and a big thermal electric power station. The city of Neryungri will push its buildings up over the taiga.

Strip mine development and production are being conducted simultaneously. In order to gain access to the upper "shelf" of the underground energy trove, a large volume of overburden must be removed. The miners are doing shock-work labor. The June target is being met ahead of schedule. Trains hauling Yakutia coal to the factories of Siberia and the Far East are leaving the Ugol'naya yard one after another.

"By year's end we shall produce 100,000 tons of coal above target," stated excavator operator V. Kurmazov, who was a participant in shipping off the millionth ton.

The country's first excavator with a bucket capacity of 20 cubic meters is being erected at the mine. It was fabricated by the famed Uralmash to order for the Yakut miners. Soon Soviet-built 120-ton dump trucks will appear at the mine, being built specially for the Neryungri operation.

The river of coal is growing larger and swifter day by day. The black pearl of the Yakut ASSR is yielding up its riches to man.

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## FUELS

### FRG-USSR EQUIPMENT, GAS DEAL DETAILED

Hamburg DER SPIEGEL in German 23 Jun 80 p 25

[Article: "Discreetly Settled"]

[Text] The concept for the most spectacular deal of German industry with the Soviets has been concluded just in time for the chancellor's trip.

When Helmut Schmidt flies to Moscow next Monday, for a change there will not be any top managers in the Luftwaffe Boeing. Not wanting to irritate the American friends with a demonstrative display of German-Soviet business, Bonn's chancellor decided to forgo the usual travel companions from industry and banks.

However, seldom would the participation of prominent industrialists in a chancellor-trip have been more appropriate than during the current tour to Moscow. Shortly before the trip West German businessmen and Soviet ministers came to an agreement regarding the biggest Eastern deal to date.

Some 40 billion cubic meters of natural gas--in addition to the current deliveries of 12 billion cubic meters--are to flow annually into the distribution network of the Ruhrgas company of Essen and its European partners, starting in 1984.

In return, Duesseldorf's pipe producer Mannesmann will be the prime contractor for the construction of a pipeline network valued at some 15 billion marks. Further contracts, amounting to some 5 billion marks, will go to Western firms producing compressors and cooling facilities.

Financing for the 20-billion super project is to be undertaken by a group of banks, led by the Deutsche Bank. For months the German banking and industry trio has been clarifying details with Soyuzgaseksport officials. The official offer, however, has been reserved by the Kremlin leadership for the chancellor's visit.

The Bonn cabinet has been making quiet preparations. The last German reservations regarding the deal with the East were settled by the Bonn cabinet

3 weeks ago. The cabinet concluded that even a Russian participation of 30 percent in the German gas import structure would not yet represent an energy-policy risk.

To permit the gas to flow as early as 1984, the entire 5,000-kilometer long pipeline is to be planned, delivered and installed under Mannesmann's direction together with all facilities and pumping stations.

In the beginning of the 1970's, when the first three agreements with the West were concluded, Mannesmann merely delivered; planning and installation were reserved by the Russians.

The size of the delivery and the time pressure left the Soviets no other choice but to surrender the entire management of the mammoth-undertaking to the Duesseldorf pipe concern. Only Mannesmann appears to be in the position to manage a contract of such dimensions at the present time.

Even the Japanese steel concerns had to pass. They lack the knowhow and sufficient capacity for the new pipe-gas deal.

Mannesmann was especially helped by a new pipe-dream that was presented by the concern's chief Egon Overbeck in Moscow: Pipes that could withstand gas pressures of 100 atmospheres. That is 25 atmospheres more than the previous pipes could withstand.

Even though Overbeck wants to make as many 100-atmosphere pipes in his pipe factory as possible, Mannesmann will not be able to deliver the pipes in the short time frame. Thus producers from the other countries participating in the gas deal are to participate--from Italy, France, Belgium and Holland. The subcontractors--including the state-owned Salzgitter concern, will deliver standard pipes of 75 atmospheres.

For safety reasons the Soviets want to install the high-pressure pipes only in uninhabited areas. The other pipes are to be installed in populated regions.

There are still negotiations to be made over the details of financing. The Russians will pay for the pipeline with revenues from gas sales. But since the entire network has to be installed before any gas will flow through the pipes, Western credits have to be obtained.

Friedrich Wilhelm Christians of the Deutsche Bank clarified the credit plans during two short-term visits to Moscow this year. Under his leadership 20 German banks and a dozen foreign lenders will secure the 20-billion credit.

The amount of interest is still open, however. The Soviets will not be able to force the low interest rate of a little more than 6 percent that was obtained at the beginning of the 1970's. This time they will probably have to pay some 8 percent.

The most difficult part in the negotiations that have to be concluded by the summer is played by Klaus Liesen, director of Ruhrgas. During preliminary negotiations in Moscow the manager of Europe's largest gas concern learned that the Russians want to make plenty out of the latest deal.

The additional gas, argued Soviet representatives, would have to be pumped from the Yamal peninsula in North Siberia, an area difficult to reach and very expensive to exploit.

Actually, the Western managers have learned, the gas is to be obtained from two reservoirs around Medves and Urengoy that have long been tapped and have a reserve of 20,000 billion cubic meters.

The Essen gasman can nevertheless hope to keep the prices reasonable. His trump? He can point out to the Russians that no other consortium in the world wants to purchase so much Soviet gas.

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## FUELS

### BRIEFS

DRILLING RIG REMOTE CONTROL--Khar'kov -- A remote-control telemetry system designed by Khar'kov scientists will make it possible to speed up gas well drilling. Yesterday this system assumed control of all drilling processes at the Krestishchenskoye gas field, the republic's largest. Monitoring of drilling rig operations has been automated: rigs can be situated dozens of kilometers away from the control console. Highly-sensitive sensing devices monitor accuracy of observance of preselected drilling process conditions. All information is fed to the console, where it is displayed on a panel and recorded on tape. This makes it possible much more efficiently to utilize the complex drilling equipment and, most important, to ensure reliable, mishap-free operation. This new product from Khar'kov can also be successfully utilized in other Soviet gas fields. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 6 Jun 80 p 2] 3024

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